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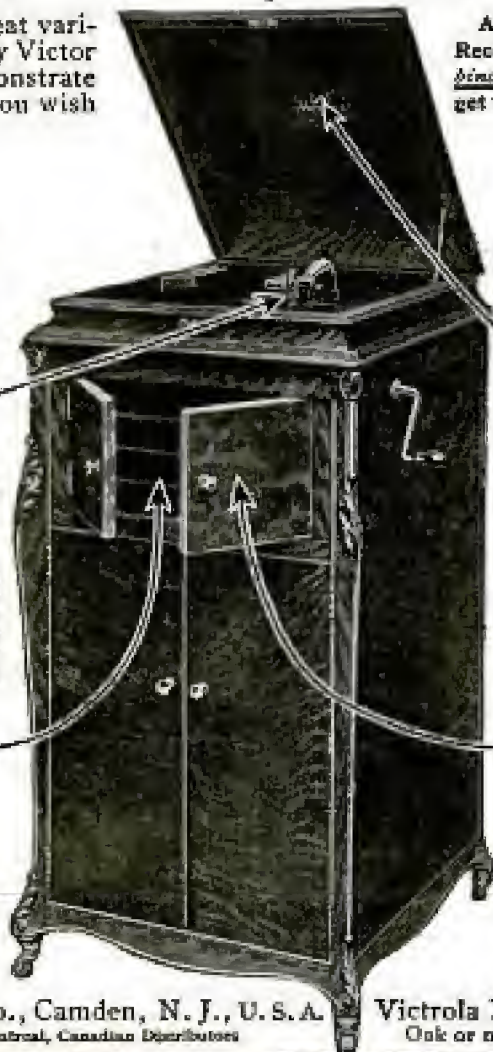
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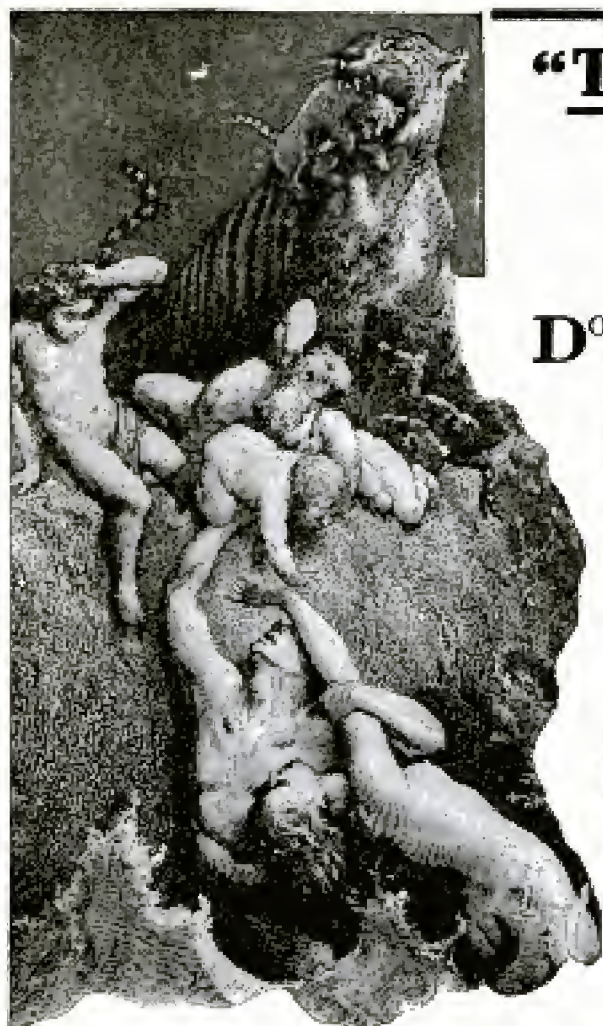
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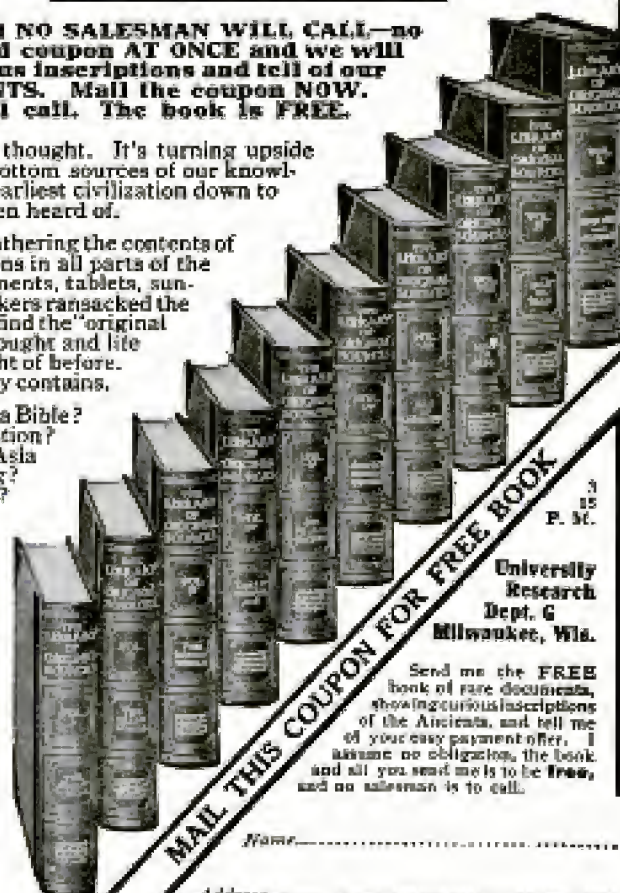
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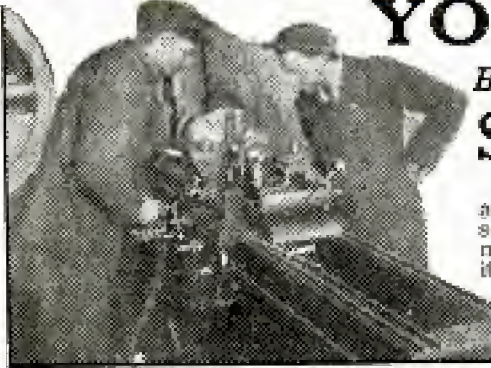
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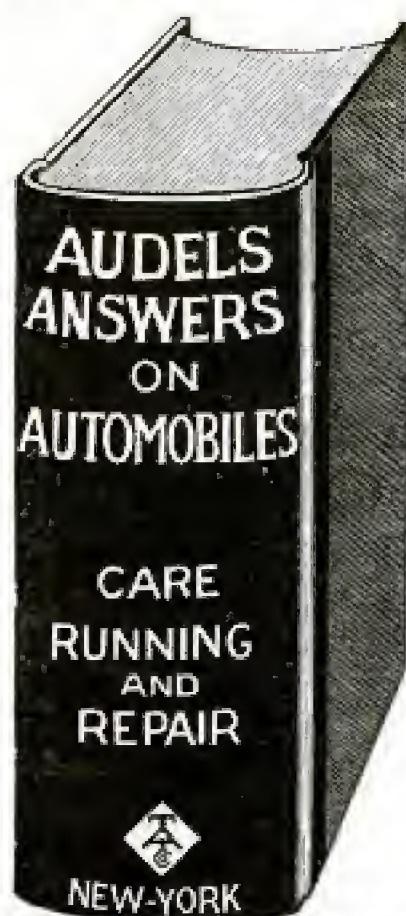
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How to handle the mind in Creative Thinking.
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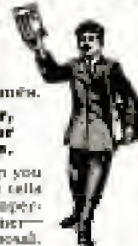
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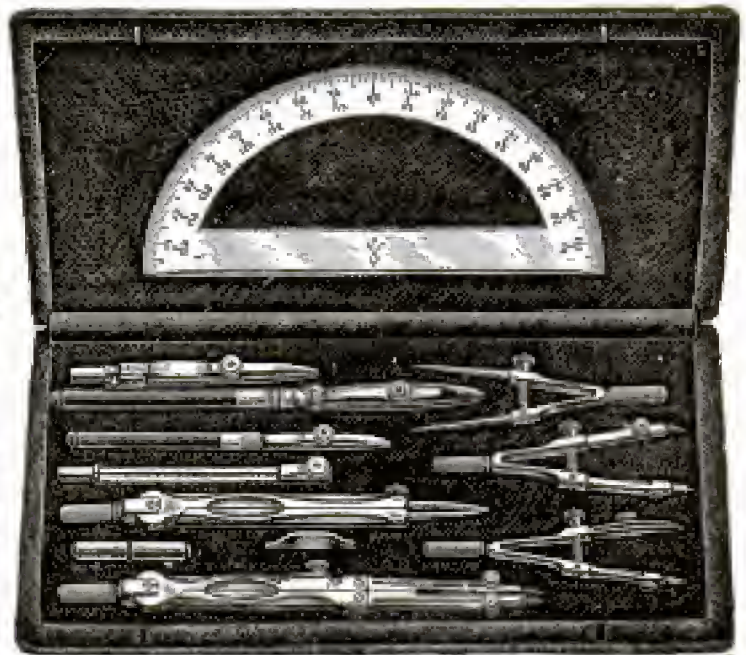
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UTILIZE your spare time. Start a profitable mail business at home. Receive your own boss. I'll show you how without advance payment. You pay my fee from profits. No success, no fee. Particulars free. Postage appreciated. Export, 420 Home Bank, Baltimore, Md.

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THIS beats Illinois. Charters for stock companies lower than other states. Information free. Philip Lawless, former assistant secretary of state, Huron, S. D., 101 Dakota Ave.

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LEARN to collect money. Good income; quick results. Send for free booklet, "Skillful Collecting." Collectors' Association, Long Street, Newark, Ohio.

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AERIAL "Ads" are top notchers for publishers. Big money. Get in the game. Conner-Kline, 2508 McLean Ave., Chicago.

DON'T pick your own pocket by using poor sales letters. As professional business writers we give you field and your business exhaustive study, then construct letters and booklets that must bring you orders. Martin & Miller, Advertising Consultants, Business Department, 229 Fourth Avenue, New York.

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GET Success—Read "H. K." Thousands helped. Marvellous results. Particulars free. Winslow H. Chase, Washington, D. C.

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AGENTS—Would \$25 to \$90 per week in practically any locality interest you? In more populous sections, hustling agents really make \$75 to \$125 per week, selling our Sentinel Burglar Alarm. Actual sales tests prove this. Amazing new invention—just out—retail price one dollar. Sells quickly at sight to houses, offices, stores, hotels. Handsomely nickel plated—mechanically perfect—weight, 7 ounces. It provides perfect and cheap burglar insurance. Every home needs and wants one or more. Instantly attached to any door knob. Impossible to turn knob or open door without ringing bell. No batteries, wires, screws or nails are used. Just turn thumb screw and it is ready for instant action. Patented. No competition. For one dollar we will send one postpaid with our descriptive circular. If not entirely satisfactory, return it and we cheerfully refund your dollar. Write for our most liberal terms to agents. We want only live, aggressive workers who will actively push sales. Marshall Robbins & Company, Manufacturers Household and Office Appliances, 1422 Marquette Bldg., Chicago, Illinois.

OUR Agents are earning money selling the cutest household specialty just out. The Star clothes line Reel, 70 feet of line. Fully guaranteed. Sells at sight. Every lady wants one. Big demand. Make \$15 to \$25 daily. Write for proposition. Utility Mfg. Co., Riverside, Iowa.

AGENTS Wanted—Right here is the one big chance of your life. If you want to make great money—\$10 a day or more, as easy as rolling off a log, and get your well clothes free besides, you can do it by acting as our agent. We are the biggest people in the business and want our agents to make big money and be happy, stylish dressers. Send a postal today for free \$10 outfit, including a big book of nobby selling samples to select your well agent's suit from. Then take orders from people who admire your nifty clothes. They come to you—not you to them. This is the way to get rich—the sure, easy way. Remember, you need no money—everything is furnished by us free. We pay express on everything. Just send a postal, but do it today. You can't get started too quick, making this big money and wearing these stylish clothes. Address card to Paragon Tailoring Co., Dept. 314, Chicago, Ill.

GENERAL Agents—Capable of calling on the big trade themselves and handling canvassers for the house to house and office to office business, to sell the newest electric specialty on the market: sold everywhere there is electricity, in the home, office, factory, store, hotel; liberal profits; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; shows how to use one light instead of two and get the same results; sells for \$2.50, \$3.50, \$5.00, and saves the purchaser an investment of \$25.00. Write for particulars. The Handy Light Co., 152 Handy Light Bldg., Cincinnati, Ohio.

YOUNG Men, would you accept a tailor-made suit just for showing it to your friends? If you live in a town smaller than 10,000, write Banner Tailoring Co., Dept. 975, Chicago, and get beautiful samples, styles and a wonderful offer.

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THE Addi-Phone attached to a telephone makes hearing easy in noisiest places. Every telephone user wants one. Wagner Co., 1452 Peoples Gas Bldg., Chicago.

AGENTS Wanted—If you know a chance when you see it you'll see this one now. Big money—stylish, nifty clothes—little work—no experience or capital needed—can you beat that? We want agents everywhere to take care of our business in their localities and to advertise our nifty, nifty suits by wearing them. We furnish everything complete and charge nothing for agents' outfit. The swiftest dressers everywhere are our agents and all we ask is that you tell people who inquire about your fine clothes where and how they can get them. You make big money—\$10 a day—without trouble. Just a postal brings you full outfit free. Big, new sample book of up-to-the-minute suitings sent so you can pick out your first suit; also measuring blanks and everything you need. We pay express on everything—not a penny for you to pay. Send quick before some one else gets the agency there—mail postal today to the American Woolen Mills Co., Dept. 314, Chicago, Ill.

YOU can make big profits selling our order getting line of guaranteed goods. \$200,000 firm and liberal credit plan backs you. We have an attractive general agency offer. Valuable premiums. Wm. J. Dick, Mgr., Dept. 721, 20 W. Lake St., Chicago.

\$1,000 PER MAN per County. Strange invention starts world—agents amazed. Ten inexperienced men divide \$48,000. Reinstated, a farmer, did \$2,200 in 14 days. Schleicher, a minister, \$185 first 12 hours. \$1,200 cash made, paid, banked by \$100,000 in 30 days; \$15,000 to date. A hot or cold running water bath equipment for any home at only \$6.50. Self-heating. No plumbing or waterworks required. Investigate. Exclusive sale. Credit given. Send no money. Write letter or postal today. Allen Mfg. Co., 4016 Allen Bldg., Toledo, Ohio.

KEROSENE Gas Burners in cook stoves or ranges stop use of wood or coal. Recently patented. Money-maker for agents. The Vapor-Gas Burner Co., Desk 5, Columbus, Ohio.

PROFITABLE Business; new discovery. Guaranteed business, sells direct to motorists. Increases mileage 50%. Has wonderful merit. Quick demonstration proves claims. Agents wanted everywhere western hemisphere. Manufacturer, 18 Natoma, San Francisco.

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MEN, hurry, get exclusive territory for our new line household article. Write today. Keystone Products Co., 13623 Alhambra Rd., Cleveland, O.

AGENTS, \$6 to \$12 a day easy. 250 light weight, fast selling, popular priced necessities, food flavors, perfumes, soaps, toilet preparations, etc. Agents' outfit free. Write today—quick—now. E. M. Polman, Sales Mgr., 362 Third St., Cincinnati, O.

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YOU can make big money selling electrical diamonds. Send 10 cents for samples of sapphire or ring. Our catalog is a winner. Send for it. Leon Wilder & Sons, 83 Bowery, New York.

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SOAP Agents. Make more money selling Luro Products. Coffee, flavorings, spices, soaps, perfumes—125 other items. Big commission. Exclusive territory. Freight allowed. Extra free premiums besides cash given. Free sample case. No deposit required. Particulars cost nothing. Write today. Luro Company, 13 Luro Bldg., St. Louis, Mo.

\$100 PER month and expenses—Salary or Commission—Introducing our King Butter Separator. Produces best grade of butter from cream or milk, sweet or sour. In less than 5 minutes. Details \$5 up. Write for free sample and salary proposition. De King Mfg. Co., Dept. 137, Chicago, Ill.

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AGENTS—Spare or all time. Big profits. Complete line diamonds, watches, jewelry. No capital. Sell cash or installments. A. R. Engelbrecht & Co., Three Oaks, Mich.

50% PROFIT selling our wonderful sign letters for office windows, store fronts and glass signs; resembles sheet gold leaf; easily applied; samples free. Metallic Letter Co., 401 N. Clark St., Chicago.

IDEAL Lamp Filler saves bother filling lamps. Men and women carriers and agents. Good opportunity to make money. Samples A & B 25c. Harry Otto Mayer, Box A3208, Boston, Mass.

AGENTS—Stamping names on Pocket Key Protectors; sample check with your name and address, 12c. Stamping Outfit. Emblem Checkers, Check Pads, Name Plates. Hart Mfg. Co., Desk 2, 393 Degraw St., Brooklyn, N. Y.

AGENTS—20% profit. Wonderful little article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Mathews, 1902 Third St., Dayton, Ohio.

300 TO 400% Profit to Agents selling our guaranteed U. S. Fire Extinguishers. Tremendous demand. Orders repeat. Exclusive territory to county and district managers. United Mfg. Co., 1508 Oakwood, Toledo, Ohio.

NOVELTY—Tip your hat without touching it. Sample and prices 10c cents avert. E. M. Plummer, Dept. "A," 926 Fullerton Ave., Chicago.

AGENTS, biggest line, biggest profit, extracts, perfumes, medicines, spices, jelly powders. Premiums for your customers. Western Laboratories, 1939 Van Buren St., Chicago.

TWO cents buys big ideas. We tell you how to make money; capital of \$10 is plenty; your spare time completes the investment. Send stamp to Business Textbook Co., Jewellers' Building, Philadelphia, Pa.

ENERGETIC Agents calling on factories and building owners of every kind can earn \$25.00 to \$75.00 weekly handling our high-class building specialties. Write today for territory. The Colcraft Company, 1249 Colcraft Bldg., Cleveland, Ohio.

LIBERAL commissions, high-class toilet and household articles, repeat orders. Dept. B. The Hamilton Company, Mfgs., Wash. D. C.

MANUFACTURE patented novelty which may be sold in 5 and 10c stores. Would like to arrange with salesmen to handle the same on commission basis. C. E. Beals, 5 Hayden Lane, Worcester, Mass.

AGENTS—Sell Fibersilk specialties—ties, jabots, scarfs and shawls. Made by new process on patented machines in many rich, beautiful colors. Brilliant silver lustre—washable. Ties sell quickly at 35c and 50c—and sell for 25c and still net you 100% profit. Scarfs and shawls sell for \$1 each. Exceptional proposition for spare time and agents. Send 15c for sample tie (guaranteed). Fisher Knitting Company, Oak St., Ulen, N. Y.

AGENTS—To sell the newest electric appliance on the market; sold everywhere there is electricity. In the home and office; liberal profits; sales-driving sample, weights a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for \$3.50 and saves the purchaser an investment of \$25; write for particulars. The Handy Light Co., 14 Handy Light Bldg., Cincinnati, Ohio.

AMERICA'S daily necessity—Free sample. Wm. E. Simmons Co., Hicksville, Ohio.

MAKE and sell your own goods. Our Information Bureau tells how. Fine Formica Catalog for stamp. D. Mystic Company, National Union Building, Washington, D. C.

AGENTS—Let us show you how to earn \$15 daily calling on automobile owners. Send for free particulars. Amos Rudy, 80 Locust Street, Detroit, Mich.

We need one active, reliable person in every community to take orders for our popular mechanical books. You don't have to be a book agent. These books do their own talking. Simply show them. They contain just that sort of information about how to do and make things that every mechanically inclined person is looking for. And they are reasonable in price. We allow you a liberal commission for this pleasant work which you can do during spare time without interfering with your regular occupation. Don't neglect this real opportunity, but write now for full details to Manager Book Dept., Popular Mechanics Magazine, 6 N. Michigan Ave., Chicago.

AGENTS—Something new—fastest sellers and quickest repeaters on earth. Permanent, profitable business. Good for \$50 to \$75 a week. Address American Products Co., 509 Third St., Cincinnati, O.

"JEFF" Ironing Board Cover and Clamps is the biggest red-hot seller ever invented. 150% profit. No competition. Lake Shore Manufacturing Company, Michigan City, Ind.

IT will pay you to write me before you take an Agency for Guaranteed Aluminum Utensils. I have an attractive general agency offer. Wm. J. Dick, Mgr., Dept. 6-12, 20 W. Lake St., Chicago.

AGENTS Wanted—To advertise our goods by distributing free sample to consumer. 30 cents an hour. Write for full particulars. The Facer Company, 1662 West St., Dayton, O.

FITS-UP-POF aluminum coffee percolator fits any coffee pot. Agents wanted quick. Big profits. Write today for circulars. Standard Spinning & Stamping Co., 2240 Smead Ave., Toledo, O.

We have several openings for establishment of independent mail-order business. Energy, good habits and sound judgment more important than capital. Spare time as first. Particulars free. Opportunities Exchange, Buffalo, N. Y.

NEW Inventions; City and country agents wanted. Samples twenty-five cents, silver! Hurry! Royal Sales Company, Columbus, Ohio.

AGENTS, office men, employees—Biggest money maker out. Every office buys one or more. Newly invented. Launching for stenographers, Marvellous, ingenious. Placed on trial, 100% profit. Exclusive territory. Write quick. Inequitable Mfg. Co., 160 No. 5th Ave., Chicago.

I WANT an agent in every town, to sell my wonderful Wrench. 10 Reasons why every Auto or Cycle owner, every Carpenter, Farmer, Plumber, Machinist and Mechanic buys at a glance. Best 1915 Agents Proposition. Big profit maker. Sample only \$2. Satisfaction guaranteed, or money refunded. Paun Novelty Co., 265 Monahan Bldg., Chicago.

AGENTS are making money selling our big 10c Packages of 20 Assorted Postal Cards. "5,000 Varieties." "Big Profits." Sell everywhere at 10c. Sample Packages 10c. Particulars Free. Sullivan Card Co., 1234 Van Buren St., Chicago, Ill.

We pay \$30 a month salary and furnish rig and all expenses to introduce our guaranteed poultry and stock powders. Address Higler Company, 2888 Springfield, Illinois.

AGENTS for Ho-Bo-Co Skin and Kendo Soap, perfumes, toilet articles. Our prices are lower, quality of products better, orders repeat. Roden, 212 N. Second, St. Louis, Mo.

AGENTS make 100% to 200% on article of universal use. Earn \$5 to \$15 daily. Direct Supply Association, 509 Belmont House, Victoria, B. C.

AGENTS: War Book, show cards, post cards, tricks and novelties. Catalog free. Write right away. World Publishing Co., Box 433-P, Chicago.

AGENTS: Vacuum sweeper, new design. Everybody buys, big profits. \$5 to \$10 daily. Jeffrey E. Sullivan, 215 Bedford St., Fall River, Mass.

AGENTS: Good side line, New. Hub Specialty Mfg. Co., Boston.

AGENTS: Graham's Self-Heated Socks. Patented. Price no higher. Guaranteed never creep down. Don't pinch leg. Fine gauge, wear-for-ever quality. Send 25c for samples. State size. Graham Company, 536-P Forest Ave., Oak Park, Ill.

1,000% PROFIT: manufacturing links. Start at home during spare time. Capital and experience unnecessary. Enormous and endless demand. Our secret formulas and some selling plans insure you a lucrative, steadily increasing business. Investigate immediately. Particulars free. A. Cusert, Secretary, 1935-899 Kenwood Ave., Chicago, Ill.

THE Kansas Company will start ambitious man or woman in fast growing business; our locality: \$3,000 yearly; spare time; no canvassing; no experience. We furnish everything. Write for unique selling plan. C. W. Kewstone, President, 140 E. 5th, Pittsburg, Kansas.

400% PROFIT: Evergrip Gliders—No rollers; pocket samples free; anyone can attach; cost 3c, sell 15c; houses buy dozens, hotels hundreds; save doors and carpets. S. M. Co., 4111 Warren St., N. Y.

AGENTS: Share in the profits. Every person handling our line from now on, will receive on June 30th a bonus of 10% on the total amount of his orders in addition to regular commission. Write today for new catalog. Oestrich Sales Co., Dept. 50, Two Rivers, Wis.

INVENTOR'S best newspaper, three months, 10c. Inventor's Advocate, Dept. 47, Washington, D. C.

AGENTS: Earn \$30 weekly selling my household and office specialty. R. F. Maddox, Brownsville, Tenn.

SALISBURY: agents; everywhere. Now auto fuel. Permanent. Profitable. Tank Chemical Sales Co., Cleveland, Ohio.

\$15.50 WEEKLY: introducing and selling a new gas light burner for kerosene lamps. Beautiful light. No chimney. No mantle. Perfectly safe. Simple in construction. Nothing to get broken or out of order. Will not burn out. Durable. Will last for years. Low price. Easy to sell. 200 per cent profit. Experience not necessary. Sample free. Why not try one on your lamp? Beware of imitations. No branch office. Luther Manufacturing Co., Dept. 439, Cincinnati, Ohio.

AGENTS: Sell rich-looking imported 35c 68 Hugs, \$1 each. Carter, Tenn., sold 115 in 4 days. Profit, \$57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel sent prepaid, 98c. Condon, Inspector, Stonington, Maine.

NEW 1915 Model: Spend no money. Just your name written plainly on a postcard and learn by return mail how to get the best Vacuum Cleaner on the market, without costing you one cent! We are putting them out for demoralizing purposes. Guaranteed 5 years. Reliable live agents wanted everywhere. Write today to The Warner Company, Dept. 2, Muncie, Ind.

YOU double your money on the popular Hygienic Milk Bottle Holder, Sample, 15 cts. prepaid. Catalog free. Weymouth Household Supply Co., Box 357, Springfield, Massachusetts.

BARNES electric vacuum cleaners offer high grade agents an opportunity to average \$40 weekly. Refills at \$18.75. An easy seller. You have exclusive territory. Write today for full information. Advance Mfg. Co., 16 Willard Street, Kalamazoo, Mich.

AGENTS sell "a repeater," quick sales, big profits; great labor saver, needed and used regularly every week; first trial makes a steady customer; descriptive circular tells why; free sample proves. Liberty Co., Chicago Falls, Wis.

"STOP Smoking!"—Klistobac will stop the tobacco habit in three to five days. Price \$1. Guaranteed. Circular free. Agents wanted. Anti-Tobacco Remedy Co., Department B, Omaha, Neb.

\$5 TO \$10 Daily Profit selling Guaranteed Household articles. \$1.50 premium with each \$1.98 sale. Kansas Supply Co., Florence, Kans.

JUST out—150% profit. Large changeable sign with 240 letters. 50c complete. Every merchant buys. Changeable Sign Co., 589 E. 102nd St., Cleveland.

AGENTS: To sell new, patented can opener; sells on sight; something new. Wanted in every house. High-grade article. Send 25c for sample. Money back if not satisfied. The Stevenson Sales Co., 3111 East 52nd Street, Chicago.

NEED money? I make \$5 day, mail-order business; spare time. No can you. 25c brings complete plan and sample. Satisfaction guaranteed. W. P. King, Little River, N. J.

AGENTS Wanted: Greatest selling novelty. German silver tea forms. Samples sent for 10c. Penna Novelty Co., 1981 Amsterdam Avenue, New York.

AGENTS: Big profits. Manufacture—sell Picture Hooks; tools unnecessary. Sample and instructions, 50c. Household Specialties Co., Wilmette, Ill.

AGENTS: Most necessary suitable article ever marketed. Over 100% profit. Absolutely new. Demonstration sells. 24c brings sample and particulars. Hayes Company, 4152 Kenmore, Chicago.

STOP wearing rubbers and send 25c for sample of our water-proofing for shoes. Something new. A life proposition for live, hustling agents. Seal Products Co., 1144 W. Kinzie St., Chicago, Ill.

ENDLESS Neckties—Something new, better ties in one; costs no more than old style; man made \$70. Three days; woman made \$32. Week; write for special agents' offer. Endless Necktie Mfg. Co., Dept. 10, Kansas City, Mo., or Universal Products Co., Toronto, Canada.

AGENTS wanted to represent an entirely new, low-priced article for automobiles; experience unnecessary. F. Angeles, Seattle, Wash.

AGENTS: \$1 to \$3 daily. 200% profit selling Joy-O. Something new for mechanics, chauffeurs, auto owners, women in the home—everybody. Sure repeater. Establish permanent business. Get free details. Large sample 15c. Write Joy-O Chemical Company, Dept. B, Toledo, Ohio.

AGENTS: Either sex, decent commissions. Toilet articles of merit. Address McCanna, 1205 East King Street, Lancaster, Penna.

AGENTS: Don't spend your own money. We trust you to \$3.50 worth. Starr's Powdered Enamel renders chipped and rusty spots on graniteware. Stops all leaky metal-ware without heat, soldering iron or tools. An old cashwife does the trick. Never hardens in the box. Very hard 24 hours after making with soft water. Ladies doing as well as gentlemen. Everybody making repeat sales, a reason why agents are doubling up their orders. 10c gets sample and particulars. Starr, 1930 Monroe St., Toledo, Ohio.

BE a Demonstrator: Learn this wonderful new profession. Earn \$1,600 to \$2,500 a year. We place you in position free, that pays from \$3 to \$10 a day while you are learning. Complete instructions as you can start in a few days for 10c to pay postage. Mollam Benditt, 2204 Orchard St., Chicago, Ill.

AGENTS: Quit hard-work-no-pay-canvassing. Wonderful French Process opens enormously profitable business. No capital; no selling; no stock to buy. Start anywhere. Hardware, 544 23rd Street, Oakland, Calif.

POURTRAIT Men, Attention: Write at once for new catalogue. John E. Traister Mfg. Co., 2411 W. 23rd Street, Chicago, Ill.

AGENTS to take orders for Visiting and Business Cards. Large profits; outfit free; 2c postage required. Forman Printery, Waterbury, Conn.

AGENTS: We've got the whole drug trade in the United States talking—our eight big, new combination offers in Toilet Articles to sell at 50c up to \$1.75 are wonders. Elegant five-colored circulars free. Write today. Pierce Company, 222 Lake St., Chicago.

YOU can make from \$25 to \$100 per week operating Aerial "Ads" in big cities. Don't delay. Get on the job. Coyne-Rice, 3504 McLean Ave., Chicago.

AGENTS: The "Never-Slip" Clothes Line Fastener is the biggest seller on market today. Over 100,000 sold first month. 1c first in your territory to get this money maker. Send 25c for sample set of 6, and agents' prices. Standard Wire Co., Dept. P, Saginaw, Mich.

A LIVE, ambitious man, well acquainted with railroad men or in large factory, to sell town lots on monthly payments in new, fast-growing railroad shop town in early South Texas. Experience not necessary. Good commissions. Earnings should run \$50 to \$250 per week. Townsite Company, North Pleasanton, Texas.

AGENTS Wanted to sell our Gasoline Flat Irons, Table Lamps, and Lighting Systems. Use a sample 30 days and, if no sales result, return it and we will refund your money. Grand Rapids Novelty Co., Grand Rapids, Mich.

DON'T answer this advertisement unless you mean business; \$1.50 sample free; carried in vest pocket; 300% profit. Fountain Pen Searchlight Co., Hartford, Conn.

200% PROFIT. You can't beat it. Sell everywhere. Free pocket sample. Our goods get the orders. Wm. J. Dick, Mgr., Dept. T-4, 28 W. Lake St., Chicago.

AGENTS Wanted—See Trick cigarette case on page 120. Send for sample.

JAP Fire, the tough gas mantle, latest thing out, guaranteed 2 months, sample and terms, 20c. Jap Mantle Co., Beverly, Mass.

AGENTS Wanted to sell Non-alcoholic food flavors, perfumes, toilet articles, household necessities; 80% saving to consumer, big profits to agent, premiums to customers; Free sample. Apply immediately. Dept. 8, Arthur N. Christy & Co., Newark, New York.

AGENTS: A free course in General Salesmanship is given to every man of our Sales Organization. This organization is a body of successful men selling the Handy Light; that unique electrical device which cuts the cost of electric lighting in half. Sells for \$3.50, is used in home, office, store, factory; weighs only one pound. Sold by demonstration. All agents furnished with well planned methods for gaining interviews. A high-grade business for a man of ability and standing in his community. General Agents preferred. Inquire for our full proposition by addressing The Handy Light Co., 1109 Handy Light Block, Cincinnati, Ohio.

BIG Money for Agents selling Perfection Fuel Savers for stoves, furnaces, heating plants. Easily installed without letting fire go out. Saves 25% fuel. Guaranteed. Illustrated. Folder sent free. Minneapolis Fuel Saving Co., Plymouth Building, Minneapolis.

REAP the Agents Magazine and make more money. 2 issues 10c. Agent's Magazine, Chicago.

"YANKER" Tie Forum: Tremendous seller—Enormous profit. Made of pure German silver. \$2.50 per yr. (144), including circulars. 80k brand ties, 75 cts. per dz.—50 per dz. Sample Form and Tie, with full particulars, and best "Sold" ever written, sent postpaid for 10 cts. in stamps of coin. The Yankee Novelty Co., 44 E. 90th St., N. Y.

WANTED: Men and women canvassers to handle new kitchen article. Easy seller, never been seen before. Exclusive sale to business in certain towns. Experience unnecessary. Satisfaction guaranteed. Write Kottella Mfg. Co., Box 305, Central Station, Toledo, O.

NEW Automatic \$2.50 Adding Machine. Sell 10 a day easy. Big profit. Everywhere. No competition. Repeat orders. R. Bassett, 5921 Indiana Ave., Chicago.

START a Mail-Order Business at Home. I did. Took in \$124,594.08 last year. Free particulars tell how I'll start you. Address: Robinson, 188 Woodruff, Toledo, O.

BIG Textile Mills will employ everywhere reliable people to take orders for dress fabrics, hosiery, underwear and neckwear from samples. Factory prices. Spare or all time. No experience. Permanent. Many making over \$30 weekly. Headfast Mills, 20 Benson St., Cohoes, N. Y.

MAKE money operating profitable Mail Order Book business. 100% profit; everything furnished. Small outlay; particulars free. Rollins, Tremont Row, Boston.

AGENTS Wanted—Agents make 500 per cent profit selling "Novelty Sign Cards." Merchants buy 10 to 100 on sight, 80c varieties. Catalogue free. Sullivan Co., 1214 Van Buren St., Chicago, Ill.

SELL Our Attractive Brass Base Poster Frames to picture theatres, also changeable letter signs for every store; big demand; easy sales; liberal commissions. Newman Manufacturing Company, Cincinnati, Ohio.

JUST show them—The new adjustable floor and wall mop, dustless dusters and similar brushes sell themselves. Big line. Big profits. Agents write Silver-Chamberlain Co., Dept. M, Clinton, N. J.

AGENTS: Here's \$50 a week easy! Brand new device! Every housewife enthusiastic. \$1.25 profit on \$2 sale. Wonderful selling plans. Farrin Mfg. Co., Fondulac, Wis.

15 WEEK salary and commission paid one person each town selling non-alcoholic beverages. Linton Co., Kansas City, Mo.

CHRISTY Mathewson's Invention. Exciting home baseball game sells in offices or homes like wild fire. Big profits. Details free. Mathewson Game Co., Dept. 36, Cincinnati, Ohio.

MAGIC Ink Eraser. No blade, no acid. Removes ink like magic. Sells like bread in a famine. Sample 10c. Sells 25c to 35c. S. Mfg. Co., 41X, Warren St., N. Y.

ONE Hundred Formulas and Manufacturing Receipts, together with one complete \$2 working plan, for a dime. United Publishing Co., 2 Sherman Place, Jersey City, N. J.

AGENTS Wanted—\$20 weekly and more easily earned taking orders for our guaranteed iron, chrome and brass; part or full time; no delivering; no collecting. Charlton Nursery Company, Dept. J, Rochester, N. Y.

WANTED—Names and commercial information, demand increasing. Steady income at home, spare time. Booklet for stamp. Information System, 227, Marietta, Ohio.

PHOTO Pillow Tops, Portraits, Frames, Photo Pictures, Photo Plates, Postcards, Reliefs etched, Prompt shipments; samples and Cat. free to agents. 50 days' credit. Jas. C. Bailey Co., Desk A-2, Chicago.

SIGN Agents, attention: We have something to offer you that beats selling other people's manufactured letters and signs all to pieces. No previous experience is necessary. Investigate. Address: Ross System, 261 Lincoln Inn Court, Cincinnati, O.

ADVERTISE—20 words in 100 monthlies, \$1; 3 months, \$2. Sample magazine free. Lums Agency, St. Louis.

\$50 WEEKLY! All or part time; dignified, permanent business; free advertising matter; protected territory; no competition. Rudolf, Northwestern Building, Chicago.

AGENTS make \$5 profit daily. Name Plates, House Numbers, Signs, Particulars free. Eugene Litch, Buchanan, Pa., Dept. B.

YOU can sell our Raincoats. Anyone will buy. We give you one. Outfit free. Temple Raincoat Co., Box 181, Tompkins, Mass.

STOP here and write The Sign Co., Silver Creek, N. Y.

AGENTS! Billy Sunday's wonderful book, illustrated, all the rage now; also European War Books; sell on sight everywhere. Earn \$2 to \$15 per day, little work. Outfit free. Write at once, Martello Company, Bug-Inchins, New York.

GENERAL agent in every city and county; extended touring business. Legitimate, new. Our canvassers make up to \$6 a day. You can get exclusive territory and make big money. Crystella Co., 325 Washington St., Brooklyn, N. Y.

AGENTS. Article costs 3c; sells quick in homes everywhere for 15c. Free sample. Belmont Specialty Co., Dept. 11, Cincinnati, Ohio.

SAFETY First! Sell our line of Sanitary Twisted Wire Brushes. Big income assured. Exclusive territory given. Goods sell themselves. Households, Offices. Catalogue free. 3 in 1 Brush Co., 145 Beckman Street, New York.

LET me start you Manufacturing and Selling Extracts. H. Lake Co., Adair, Ill.

DISTRICT Managers, have few openings for few district managers to handle exclusive territory. Staple specialty for hardware and automobile trade, exceptional standing and financial ability to carry stock essential. Junkens Bros., 962 W. 11th St., Chicago.

AGENTS—Fifteen Whirlwind Sellers, new in your territory; pay you steady income \$3 a day or better if you are a worker. Liberal credit. Sample seen and outfit free to workers; control of your territory and other advantages. Write quickly for proposition. E. E. Britter, Box No. C-732, Linton, Indiana.

1,000% PROFIT—Prepared Sign Letters, share co-operative business free. Johnson Co., Quincy, Ill.

AGENTS—Average \$5 to \$12 daily selling astonishing Astor massage machine. New. Just patented. Different. No electricity or water power required. Nothing complicated. Affects exhilarating massage without cost expense. Lowest priced, but best outfit. Retail \$2.50 allowing you big end of the profit. Particulars and "Beauty" folder free. Aztec Remedy Co., Dept. 132, Toledo, Ohio.

AGENTS—500% profit, free sample Gold and Silver Sign Letters for store fronts and office windows. Anyone can put on. Big demand everywhere. Write today for liberal offer to agents. Metallic Letter Co., 406 N. Clark, Chicago, U. S. A.

YOU can be your own boss with our Key Check Outfit. Good for \$3 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 15 cents. Please Die Works, Dept. M, Winchester, N. H.

WE manufacture the largest line of Aluminum Utensils and Specialties in the world. Sales course free. \$50 a week easy to hustlers. Answer quick. American Aluminum Mfg. Co., Div. P.M., Lemont, Ill.

OUR national advertising helps you sell Fuller Sanitary Brushes and Dustless Mops and Dusters—full line—easy sellers. We tell you how. Biggest factory for twisted wire brushes in U. S.—reliable, strong concern. Your territory is valuable. Write at once. Fuller Brush Co., 33 Hoadley Place, Hartford, Conn. Western Branch, Rock Island, Ill.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Veehies, Desk C. H., Omaha, Neb.

BIG Profits for You! Manufacture Barley Crisp, New Confection. 5c package costs you 1c. Machine, instructions complete \$7.50 prepaid. Send 10c for samples. Barley Crisp Co., 1203 Broadway, San Francisco.

EASY pleasant work for Mechanics, Shop Men, Clerks, during spare hours, will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

AGENTS make big money and become sales managers for our goods. Fast office sellers. Fine profits. Particulars and samples free. One Dip Pen Company, Dept. 2, Baltimore, Md.

AGENTS make \$100 monthly selling our 500 handily household articles. Catalogue free. Schell Company, Des Moines, Ill.

GUTTER Free to Agents. Best selling Handkerchiefs, Dress Goods and Fancy Goods on the market. Quick sellers, big profits. Deal direct with a large manufacturer. Send stamp for particulars. Freeport Mfg. Co., 59 Main St., Brooklyn, New York.

MEDALLIONS—300% profit. Make up your own goods and be independent. Catalogue free. Hering Co., 1205 Randolph St., Chicago.

MAIL-ORDER Opportunities: 35 new propositions. No competition! Make \$20 profit on dollar orders; complete outfit 10c. Mail Dealers Wholesale House, 521 Franklin Bldg., Chicago.

AGENTS make \$5 to \$10 a day on the spot. Atkinson writes: "The best proposition I have found in my forty years' canvassing." Permanent work. Household necessity. Selling 80%. Write today for general or local agents terms. Free sample. C. H. Stuart & Co., 16 Union St., Newark, New York.

FROM Dance Hall to White Slavery, 400-page, cloth book, illustrated, \$3. Immense sale. Experience unnecessary. Outfit free. Big money quick. Charles C. Thompson Co., Manufacturing Publishers, 1128 Wabash Ave., Chicago.

AGENTS—Great opportunity to be permanent representative largest manufacturers high-grade soaps and toilet goods. \$25-\$75 weekly. Write for immediate appointment. E. M. Davis Co., R. 61, Davis Bldg., Chicago.

AGENTS—\$2 daily selling our Handy Tool, 12 articles in one, lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton Ohio.

AGENTS—\$50 weekly. We manufacture the best needle case made; a wonderful seller; 200% to 500% profit; talking unnecessary; our "Trust Scheme" envelopes do the work; general agents can make \$100 weekly; particulars free; 35c sample outfit for 10c; buy direct from the factory. Day Needle Co., 102 Davis Sq., W. Somerville, Mass.

YOU can make \$423 as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free samples; profit. J. Piddin, 113 Bodd St., Newark, N. Y.

AGENTS of ability and high character wanted on a new household article. Once 100 per cent profit. Special selling plan that pulls results. Address: Meritt & Beck, 39 to 69 Temple Place, Boston, Mass.

AGENTS—Send 10c for terms and sample of staple 25c article. Large profits. C. Lutz Manufacturing Co., York, Pa.

AGENTS: \$1,000 to \$3,000 yearly selling over eighty everyday articles to farmers. Pleasant, permanent business. Full instructions. Big chance. Write quick. Dufores Factories, North Java, N. Y.

PORTLAND Agents make big money selling our goods. Our quality is right. Prices low. Delivery guaranteed. Credit for exports. Ask for our latest catalog. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

AGENTS Wanted for a new Duplicate, Sells in every business man. Fisher Company, 113 Amsterdam Avenue, New York City.

STEADY business, liberal profits, quick repeats with our Sanitary Wire Frame Brushes and Cleaning Specialties. Household necessities. No capital required. Exclusively sold if you write today. Kleenaid Co., 71 Taylor St., Springfield, Mass.

STOP here and write The Sign Co., Silver Creek, N. Y.

NEW—Practical—Durable. The L. E. Self-Threading Sewing Machine Needle sells like "Hot Cakes." The only one of its kind sold with a guarantee. Made to fit all machines. Send 10c at once for sample and territory. The Reed Specialty Co., Putnam, Conn.

SELL Dry Goods Remnants. Greatest bargains on earth. Remnant Store Co., Cincinnati, Ohio.

WANTED—Distributors, Men and Women—to give away free pigs, Perfumed Soap, Soap Powders; no money or experience needed; good pay. S. Ward & Company, 218 Institute, Chicago.

MANUFACTURER renders general agents for patented demand of centuries. Three minute demonstration convinces. A financial independence in acceptable profits. Samuel C. Osborn, Masonic Temple, Chicago.

WRITE for our free offer. Good reliable hustling agents wanted for a real free money making proposition. Only hustlers need answer this ad. American Sales Agency Co., 601 Layton Bldg., Chicago, Ill.

STOP here and write The Sign Co., Silver Creek, N. Y.

AGENTS—Earn \$50 to \$50 Every Week selling the New Improved Monitor Self-Heating Flat Iron. Positively the lowest priced and fastest selling flat made. Over 150,000 already sold. Evans, N. Car., sold two dozen on Sat. Mrs. Nixon, Va., sold eight first half day. Every housewife wants one. Every iron guaranteed. New terms. Exclusive territory. Sample free to workers. Write today. The Monitor Flat Iron Co., 177 Wayne St., Big Prairie, Ohio.

AGENCIES WANTED

CANADIAN Agency Wanted. Patented article, suitable for canvassers. Steady, 14 Grenville St., Toronto, Canada.

SALESMEN WANTED

SALESMEN—We have some excellent territory open to salesmen of ability. This is a proposition that appeals to the best class of concerns. Sales are easy and your profits large. Write us today for catalogue J. M., covering the Schick All-Steel Paper Haler. Davenport Mfg. Company, Davenport, Iowa.

GREAT opportunity for general agents selling new specialty to merchants. Retail \$3, \$10, \$15 each. Your profit 200%. No competition. Exclusive territory. Free samples. Sawyer Co., 408 Olive St., St. Louis, Mo.

SALESMEN: Crackerjack \$5 check protector; also excellent advertising specialties; liberal commissions. E. N. Dorlag, Weyheaven, N. J.

HAVE position for salesman: good salary and expenses for a man of ability and good character; investment of about \$1,000 required. Stotts Appliances Corporation, 220 West 42nd St., New York.

\$1,500.00 to \$1,500.00 in six months can be made placing our Premium Patch Board Deals, provided you have \$200.00 to \$500.00 to invest. Washington Sales Co., Dept. P.M., Chicago.

WIDEAWAKE salesmen can earn \$100 weekly, carrying small skin line. Popular floor covering and rug border. Liberal commissions. Sell to merchant. J. C. Dunn & Co., Camden, N. J.

USEFUL advertising novelty for clothiers and tailors. Would arrange with salesmen on commission basis to handle this novelty as a side line. Something sure to sell. Worcester Novelty Supply, 5 Hudson Lane, Worcester, Mass.

SALESMAN—Experienced traveling salesman. State experience and references first letter. Well advertised line. Satisfactory commissions. The Linoges China Co., Sebring, Ohio.

AUTOMOBILE—Apprentice Demonstrators wanted on straight salary basis. No selling. P. O. Box 1068, New York City.

SALESMEN—Get our plan for Monogramming Automobiles and Motorcycles by transfer method. Very large profits. Majorists' Accessories Co., Ashland, O.

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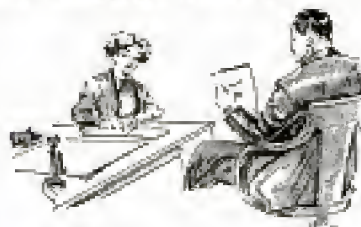
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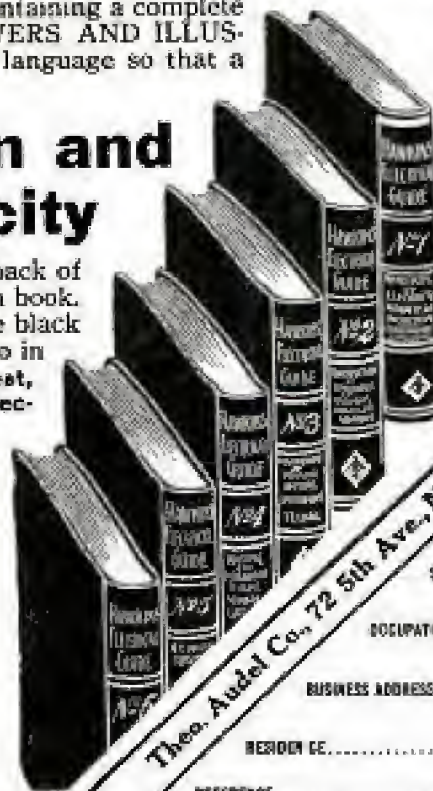
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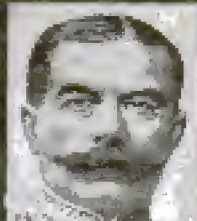
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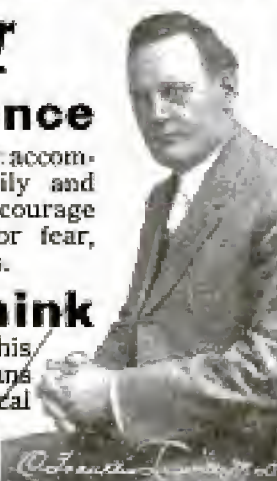
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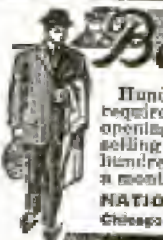
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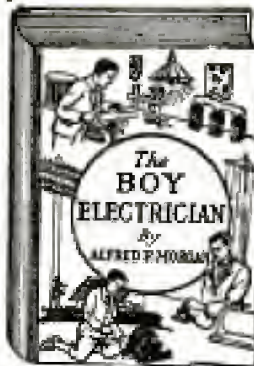
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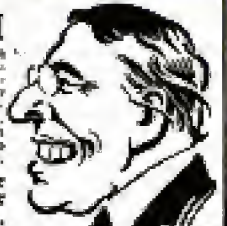
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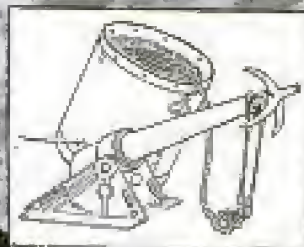
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rough material

BUILDING LONG TRUSS BRIDGE AS CANTILEVER



BECAUSE of the extreme depth of the water beneath, it was impossible to construct center supports for this railway bridge, which is being built over the Pend Oreille River in Washington. For this reason it has been necessary to build it in a single span by cantilever construction, although, when completed, it will be a truss bridge. At the present stage of work the mass of structural steel which extends out from a cliff, 150 feet in height, is being balanced by 600 tons of steel placed on the anchor arm. The river at this point is said to have a depth of approximately 230 feet.

*Miss Florence W. Werrington
Katala, Alaska*

BEACH-SAILING CARTS USED BY ALASKAN MINERS

Miners working on one of the Alaskan beaches have adopted what they

term beach carts for the overland transportation of their provisions and

"pay dirt." These odd-looking vehicles, fitted with large sails and built substantially, are capable of carrying heavy loads over the hard-beaten sand of the shore line at a rate of four or five miles an hour without requiring much exertion on the part of their owners. In many particulars they are similar to the sailing wheelbarrows of China, used by the inland farmers in transporting their produce to the market, as described in a previous issue of this magazine. The Alaskan carts usually are built with two broad wheels tired with barrel staves, nailed crosswise. There is usually a strong wind blowing in one direction or the other.



With a Generous Breeze One of These Carts will Roll Easily under a Heavy Load

INSULATION MATERIAL MADE FROM SEaweEDS

Fiber materials suitable for practically all general insulation purposes are being manufactured from a seaweed which is found in the shallows on the southern coast of Australia. By mixing the refined product with certain proportions of wool, a durable fabric is also made from it. Deposits of this vegetation abound in the vicinity of Spencer's Gulf and are accessible for commercial exploitation. Factories have been started at Port Broughton and Port Pirie during the last year, and from the pioneering work which has been done it is believed that the industry will prove to be one of some importance.

*Christian Science Monitor
1. Posidonia Australis*

DEADLY STEEL ARROW USED BY FRENCH AIRMEN

French military airmen are employing a new weapon, known as a "fêchette," which is proving to be as effective in harassing the personnel of an army as any offensive instrument yet designed for use with lighter-than-air machines. It consists of a steel arrow of about the same size and much the same appearance as a lead pencil. The head of it is tapered, while lengthwise grooves serve to give it the proper balance and allow it to travel through the air point downward. A score or more of these are dropped at one time over a trench. A report of the effect of these arrows, falling from a height of about 3,000 ft., states that one of them, striking

Underwood & Underwood

*417 Fifth Ave.,
N. Y. City*

*W. Australian Mining Tribune, Ltd.
Port Broughton, Port Pirie*



Because of Their Lightness It Is Possible to Carry Large Numbers of These Arrows in an Aeroplane, a Thing Which Helps to Make Them of More Value Than Bombs in Operations against the Personnel of an Army

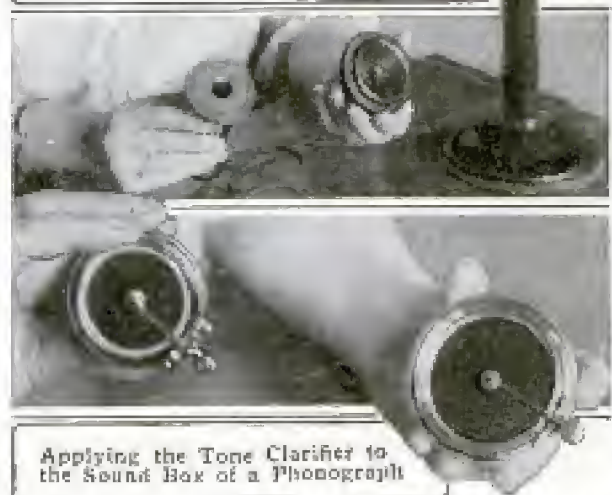
ing a soldier on the shoulder, passed entirely through his body, and traversed the length of his leg, emerging through his foot. The president of an American steel company recently asserted that he had refused orders from the French government for the manufacture of arrows of this nature.

CLARIFIER FOR TELEPHONES AND PHONOGRAPHS

A tone clarifier, recently invented, apparently provides a satisfactory cure for the tendency of the diaphragms used in telephones and phonographs to emit a shrill, squeaky sound in which the low and characteristic tones are nearly if not entirely obliterated. This tendency is due to the fact that the natural rate of vibration of one of these small diaphragms is many times higher than the natural rate of vibration of the tones commonly used in talking, singing, or playing. The new device works on the principle of weighting the diaphragm to retard its vibration and of damping the vibra-

tions of the separate parts without interfering with the vibration of the diaphragm as a whole. It consists of a combination of metallized rubber disks, stiff celluloid disks, and soft paper cushions, which is secured to the rear face of the diaphragm.

This Tone Clarifier, Which is Designed to Do Away with the Shrill Tones in a Telephone or Phonograph, is Inserted in the Telephone Receiver Back of the Diaphragm

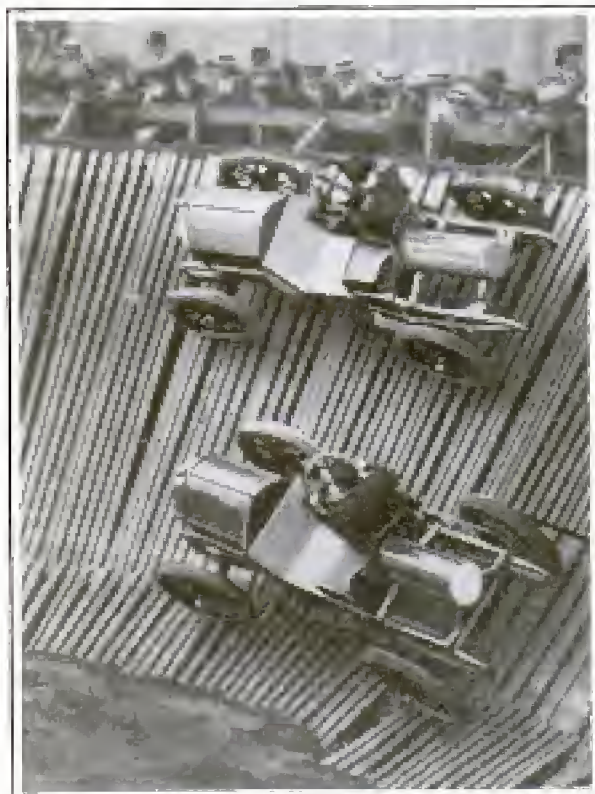


Applying the Tone Clarifier to the Sound Box of a Phonograph

3/22/15
The Gorton Manufacturing Co.
Ohio Sales Bureau of Manufacturers, Leader - News Editor
Cleveland, Ohio
Inventor Mrs. Gora Stetson Butler, Cleveland, Ohio
See March 1914-165
ad v.
 Copyrighted material

RACING WITH MOTOR CARS IN 8874 ~~W~~ WOODEN BASIN

One of the most spectacular things recently seen at the Anglo-American Exhibition held at Shepherd's Bush,



Racing Basin at Shepherd's Bush, England, Showing Two Cars Going at a 60-Mile-an-Hour Speed

London, England, was a race between motor cars in a wooden bowl. The diameter of this speed basin was small, and its side, which was made of narrow planking separated like lattice, was built on a sharp angle. Starting at the bottom the cars gradually mounted the steep slope as they gained in velocity, racing alongside at times for lap after lap while going at the rate of 60 miles an hour.

RESIDENCE HEATING SYSTEM 8930 ~~D~~ DIRT AND SMOKE-PROOF

For heating medium-sized residences, a new system has been devised in Sweden which entirely eliminates smoke and dirt and apparently approaches the ideal plan so far as convenience is concerned. A thoroughly insulated tank of from 100 to 300-gal. capacity, fitted with an electric heater,

is installed in the upper part of the house. At night, when electricity is available at a low rate, the current is turned on and the water heated. At the proper time the following morning the circuit is automatically broken and a small motor pump is started, which acts on water in an auxiliary tank in the basement, bringing about a circulation of water through the radiators. At the right time in the evening the pump is stopped and the current again turned into the tank-heating device. Practically no attention is required in operating the plant and it is asserted that 40 kw.-hr. of energy will serve to adequately heat five rooms.

"POTATO BUG" AS BIG AS A 7604 ~~B~~ BUNGALOW

A model of a potato bug 100,000,000 times as big as the real thing is one of the novel exhibits now being installed in the Horticultural Building at the Panama-Pacific Exposition. The model is not intended as an amusement feature but as an object lesson for the farmer. This bug lies on its back, and is 40 ft. long, 20 ft. wide, and 40 ft. high from the floor to its feet. It consists of a frame of gas pipe over which a painted canvas skin is laced. It contains three rooms, which are electric-



This Model of a Potato Bug, 40 Feet Long, is to be Exhibited in the Horticultural Building of the Panama-Pacific Exposition

ally lighted, and which will contain exhibits relating to the extermination of this pest. One entrance to the bug will be through its mouth.

Hamilton M. Wright
Panama Pacific Exposition
San Francisco, Calif.

Merchant Plumber & Fitter
10-25-14

WAR UNDER THE SEA

Warfare
The Submarine Torpedo Boat and the Submerged Mine are
8341 Revolutionizing Naval Strategy

WHEN the three British armored cruisers "Aboukir," "Hogue," and "Cressy" were all sunk within the space of about an hour by one German submarine, the world was given a startling demonstration of the possibilities of this type of underwater fighting craft. In the subsequent fighting at sea these vessels have played such an important part as to give considerable justification to Admiral Sir Percy Scott's prediction that when submarines have been fully developed they will entirely displace the great dreadnaughts that form the principal fighting strength of the navies of the present time.

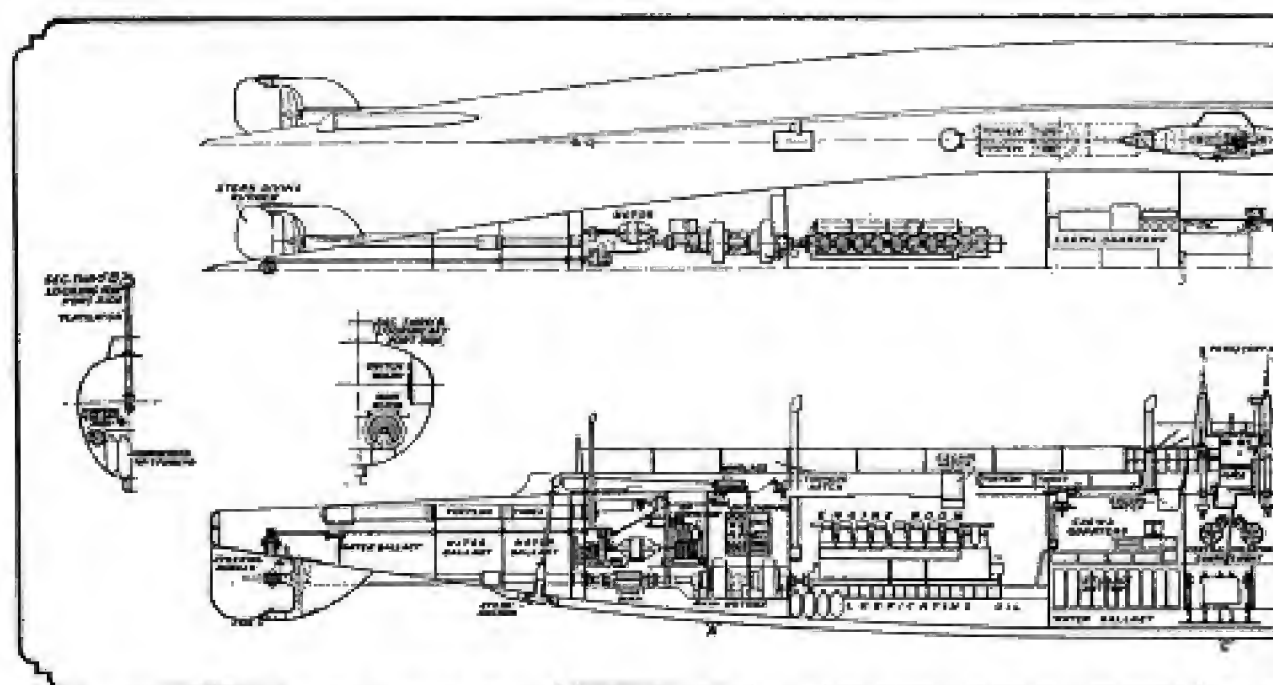
Next to this first decisive blow struck by the German submarine, the most striking underwater attack up to the present stage of the war was that of the British submarine "B-11" which stole past five cordons of mines laid to block the Dardanelles, torpedoed and sunk the Turkish battleship "Messudieh" lying at anchor at Tchanak Kalesi, and then worked its way back to safety after being under water continuously for nine hours. In December the British made a combined sea and air attack on the German naval base at Cuxhaven which not only demonstrated the fighting qualities of the submarine but its value for scouting purposes as well. It is now reported on good authority that the reason this attack could be carried out without disaster to the attacking party was that the mine defenses designed to protect the naval base had been thoroughly explored in advance by British submarines.

During the five years preceding the war, submarine fighting craft had been developed to a high state of efficiency. Among the new vessels, submersibles had almost entirely superseded the original type that bore the name of submarine. For understanding the character of the fighting craft that has come

into such prominence it is necessary to distinguish between the two types of vessels. The original submarine was designed primarily to operate under water and was far from being a seaworthy craft when running on the surface. These vessels were therefore valuable mainly for coast defense and for operations within restricted limits in connection with a fleet of warships. The submersible, while having all the underwater efficiency of the submarine, is built to operate on the surface as well; and is practically as seaworthy as a destroyer. Such vessels are capable of making long voyages and of taking the offensive independently and not simply as auxiliaries to a fleet of warships. All the later vessels, while commonly called submarines, are in fact submersibles. The original submarines still in service are used almost exclusively for coast defense.

A convincing demonstration of the seagoing qualities of the submersible was given a short time before the war when the French boat "Papin" made a voyage of 1,800 miles in 14 days, traveling much of the distance under water. In this voyage the "Papin" started from the French port of Cherbourg, passed around the coast of Spain, through the Strait of Gibraltar, and along the north coast of Africa to the port of Bizerta, in Tunis, completing the trip with only two landings. The "Papin" is over 170 ft. in length and carries six torpedo tubes.

The leading nations, belligerents and neutrals alike, are building bigger submersibles all the time. According to reports the Germans are building four of such size that they will be able to keep at sea for 40 days without having to replenish their stocks of oil or provisions. So far as is definitely known, however, a submersible to be built for the United States will be the largest of all. This vessel is to be 260

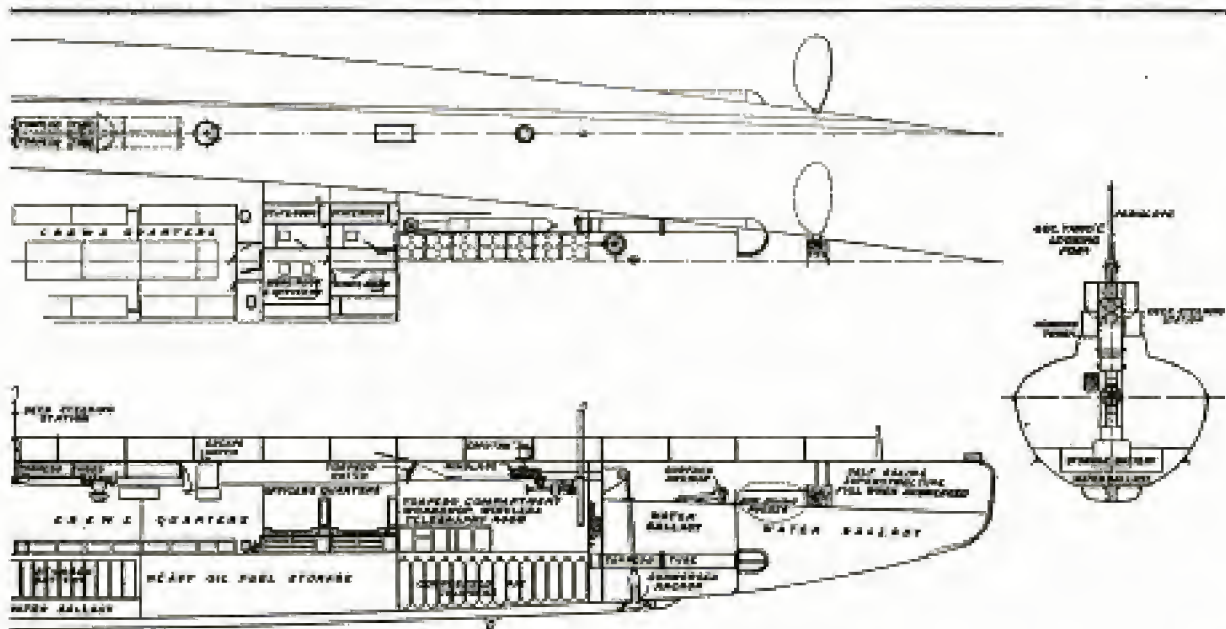


These Diagrams Show How a Typical Modern Submersible is Built; the Vessel is Equipped with Torpedo with Two Periscopes, One Facing Straight Ahead and the

ft. long and will have a radius of action of 5,500 miles. It will be capable of making a speed of 23 miles an hour on the surface and of $12\frac{1}{2}$ miles an hour when submerged. A contract for the construction of this modern "Nautilus" was awarded recently by the Navy Department, the cost being \$1,350,000.

The submarine is shaped like a cigar, a cross section at any point along the hull being practically circular. In the submersible this shape is retained for the inner shell, but over this is built a hull that gives the completed vessel the shape of a torpedo boat. The inner shell contains all the working parts of the boat, while the space between the two shells is utilized for the water-ballast compartments which, when filled, overcome the buoyancy of the craft and cause it to sink to any desired depth beneath the water. The interior of a submersible impresses one as being a thing of supreme nervous energy, with every detail devoted to the accomplishment of just one thing—that of slipping in close to the enemy's ship and sinking it with a torpedo. So completely is the vessel filled with machinery and equipment for this purpose that only very limited space can be utilized for quartering and feeding the crew.

While the newer submersibles are equipped with tubes for firing torpedoes from the stern and even from the side, the principal fighting equipment is at the bow. Here are located either two or four torpedo tubes. Unlike the guns of a battleship, these tubes must be aimed at the mark by aiming the entire vessel. Each tube is closed by a trap door that opens automatically when the torpedo is fired and closes the instant the torpedo has started on its journey of destruction. Back of the torpedo tubes is a compartment for the storage of torpedoes and in this are also sleeping quarters for the officers of the vessel. In the deck above this compartment is a hatch for taking in the torpedoes. Next comes a compartment containing one of the two electric storage batteries which furnish power for propelling the vessel when it is under water. Back of this, at the center of the vessel, is the central operating compartment, from which every movement of the vessel is controlled. Next comes a compartment containing the second set of storage batteries, then the engine room and workshop, and finally the compartment at the stern containing the propelling and steering machinery. The crew, which often numbers from 20 to 30



Tubes at Bow and Stern and Has Torpedo Tubes Amidships Which may be Trained Like Guns. It is Provided Other Mounted so That It can be Turned in Any Direction.

men on a submersible, is usually quartered in hammocks in the compartments containing the storage batteries.

Every naval submarine vessel has two complete power plants, one for propulsion on the surface and the other for propulsion when submerged. The main power plant of the most modern submersibles consists of Diesel engines using heavy oil, but gasoline engines and steam turbines are both used for this purpose. This plant supplies power for operation on the surface and for charging the storage batteries. One of the first things in preparing for submergence is to shut off this power plant, and from this time until the vessel again comes to the surface it runs on the power stored in the batteries. The next step is to close all the hatches and let the water into the water-ballast compartments. The vessel then begins to settle in the water, and as the process is continued, first the deck and then the conning tower go under water. For sinking to a greater depth, diving is usually resorted to, the vessel being inclined downward at an angle by means of horizontal rudders at the stern or by sea planes at the bow. Ordinarily the submarine is kept under the surface by the action of these devices, a portion

of the buoyancy of the vessel being retained so that it will rise to the surface in case of accident and as soon as it stops. It is easily possible, however, to take all the buoyancy out of the vessel so that it will lie securely on the bottom, or will hang as if suspended at any desired depth beneath the surface. One type of submarine is designed to be sunk to any depth by means of its water-ballast compartments alone, and is even provided with wheels for running on the bottom of the sea.

Of all the equipment of submarine vessels the most important is the periscope, a simple device that serves as the eyes of the craft when it is running submerged. On the latest submersibles two of these instruments are used, one being fixed to give a view straight ahead and the other being so mounted that it can be turned to face in any direction. Although serving such a vital part in the operation of a submarine the periscope is exceedingly simple in construction. The light enters the hood of the periscope horizontally. It then passes through a prismatic lens that deflects it downward at right angles into the vertical shaft of the periscope. At the bottom of the shaft is a second lens that again turns

Photograph Showing What was Left of a Torpedo After It had Exploded: This Was the Second Torpedo with Service Charge Ever Fired by Any Vessel of the United States Navy



The Crushing Power of the Torpedo is Indicated by Its Condition When Flashed from the Bay



Hinged Tube Cap That Opens Automatically When the Torpedo is Fired



PHOTO COURTESY
NATIONAL BUREAU OF

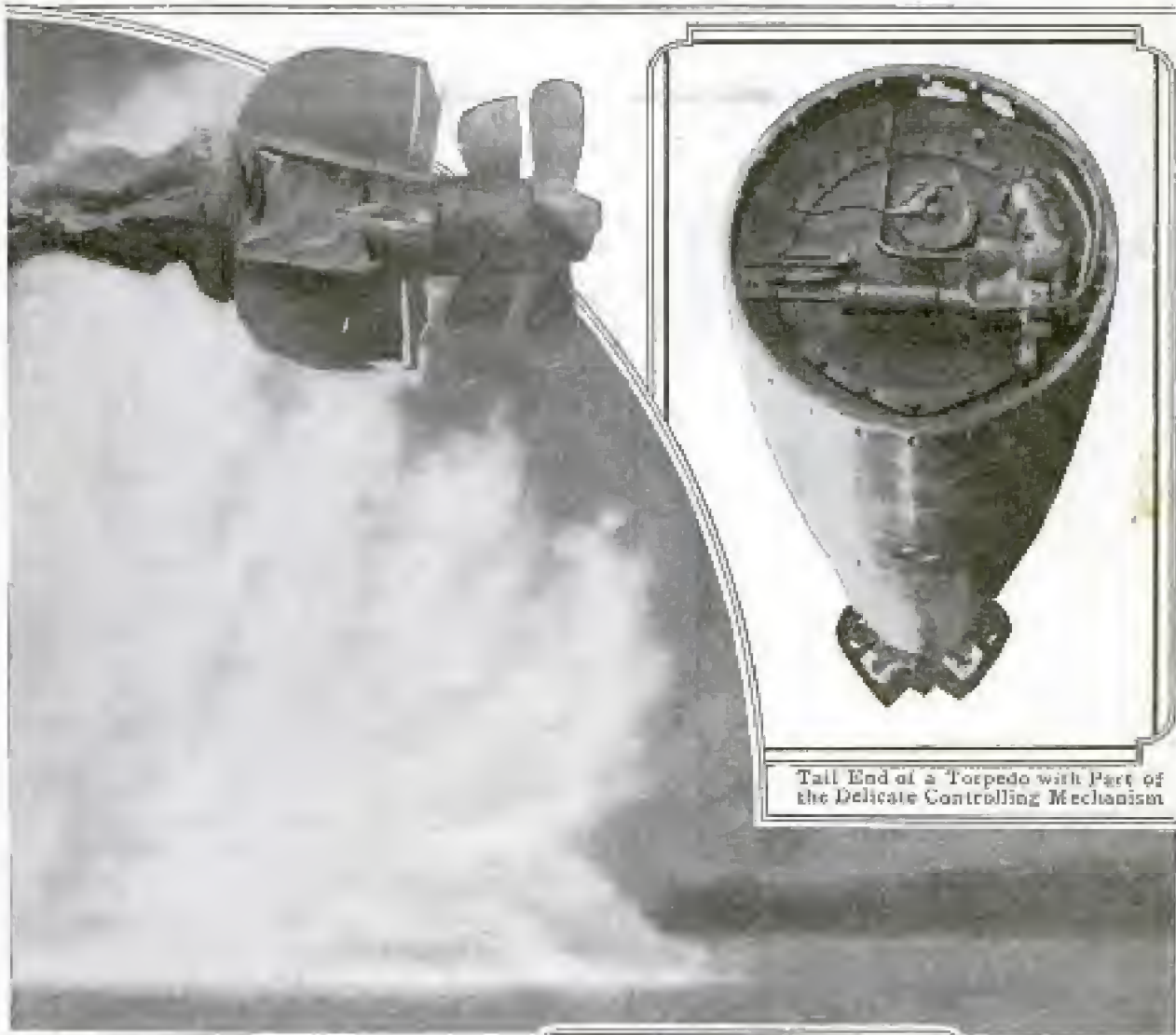
Loading an \$5,000 Torpedo aboard the U. S. Submarine "K-5" at the Charleston Navy Yard: The Torpedo is being Lifted by a Derrick and Let Down through a Hatch into the Storage Compartment Adjacent to the Torpedo Tubes



Tail End of a Torpedo, Showing the Rudders and Propellers



Charging the Storage Tank with the Compressed Air Which Furnishes Power for Propelling and Steering the Torpedo

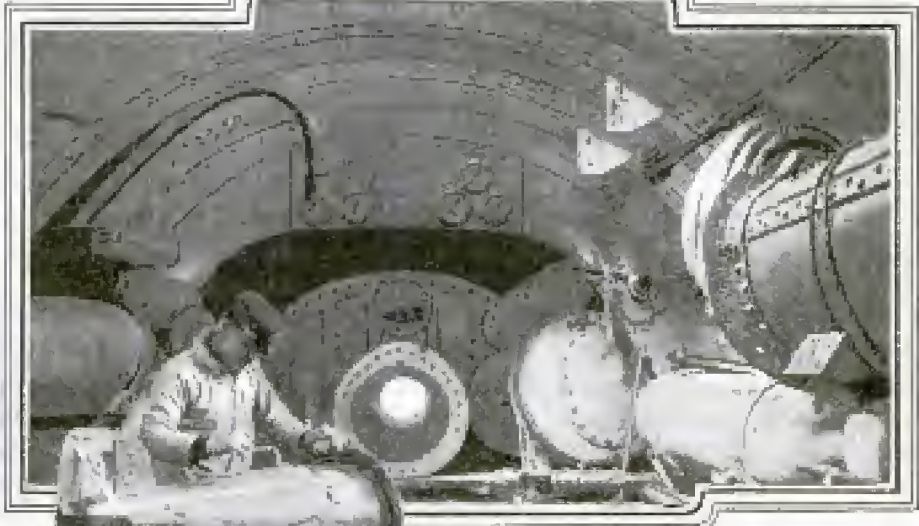


Tail End of a Torpedo with Part of the Delicate Controlling Mechanism

What Happens to the Ocean When a Torpedo Explodes: This Upheaval was Caused by Torpedo Shown Above

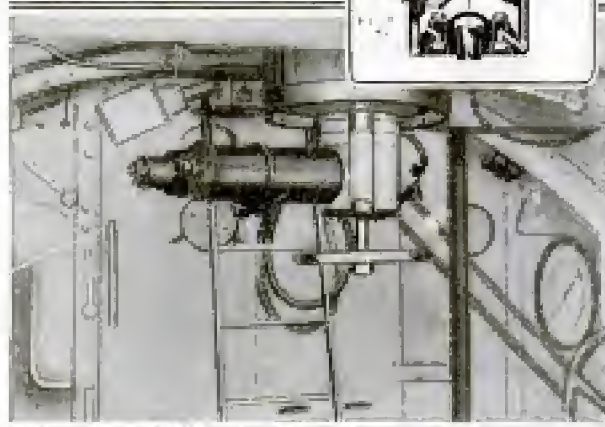


The Pilot of the Torpedo Is a Small Gyroscope, Which is Rotated by Compressed Air. With This Instrument the Torpedo is Steered Unerringly from the Launching Tube to the Mark



Where the Torpedo is Made Ready and Launched on its Journey of Destruction: In This Picture the Gunner is Shown Charging the Torpedo with Compressed Air; Straight Ahead Is the Torpedo Tube, While at the Right and Left are the Flasks Containing Compressed Air with Which the Water is Expelled from the Water-Ballast Compartments When the Submerged Submarine is to be Brought to the Surface

the rays of light to a horizontal direction. This is the simplest form of the periscope. Usually there are additional lenses for magnifying the view. After passing through the bottom lens the image is either thrown on a screen or is viewed directly through a telescope by the officer in command. The one disadvantage in the periscope is that it gives only a limited view in the one direction in which it happens to be facing. Attempts have been made to develop a panorama periscope that uses



Without Its Periscope a Submarine would be Blind When Submerged. This Picture Shows How the Commanding Officer Has a Constant View above the Surface by the Aid of This Ingenious Instrument

a "fish-eye" lens and gives a view of the entire horizon, but this device has not yet been developed sufficiently to come into general use. When the submarine is submerged, only the tops of the periscopes are visible above the surface. These are difficult to see and still more difficult to hit, and this accounts for the apparent ease with which a submarine can steal up within range of a battleship and fire its torpedo without being discovered.

Although submarines and submer-

sibles are designed for firing torpedoes, and for little else, they are not by any means the only vessels that use these deadly projectiles. Torpedo boats, cruisers, and battleships are equipped with torpedo tubes. With surface vessels the torpedo is often fired from above the water, but the result is the same in any case. The torpedo is in effect a miniature submarine that automatically takes and keeps, as soon as it enters the water, a position about 15 ft. beneath the surface, and in this position propels and steers itself unerringly toward the mark at which it is fired. The standard torpedo of the United States Navy is 18 in. in diameter and 16 ft. long. Some of the new war vessels now building have tubes for 21-in. torpedoes, of which a number have been manufactured. A torpedo consists essentially of the war head, containing about 250 lb. of gun-cotton; an air tank in which compressed air for propelling and steering the torpedo is stored; a compressed-air engine for propulsion; horizontal and vertical rudders, and an automatic mechanism for controlling these rudders. The horizontal steering is controlled by a small gyroscope, while a uniform depth below the surface is maintained by hydrostatic pressure applied in an ingenious but simple manner. A pipe open to the water projects from the stern into the body of the torpedo, where it opens against a piston. On the opposite side of this piston is a spring made to exert a pressure exactly equal to that of water at a depth of 15 ft. This piston is connected with the apparatus operating the rudders that control the vertical depth. When the depth of water is greater than 15 ft. this piston is forced inward with the result that the rudders are turned upward, and when the depth of water is less than this the spring forces the piston outward and the rudders are turned in the opposite direction.

Projecting forward from the nose of the torpedo is a plunger which is thrust into the detonating charge when the torpedo strikes. This fires the detonating charge, which in turn fires the



Right: The U. S. Submarine "K-5" Riding at Anchor; the Vessel Is in Fighting Trim with All Hands Below



Forward Deck of the "K-5": In This Picture is Also Shown One of the Hatches That Furnish the Only Means of Entering and Leaving the Submarine



The "K-5" at Full Speed in a Heavy Sea: When Hunting on the Surface the Vessel Has the Seaworthiness of a Destroyer

Right: Captain (Lieutenant) J. H. H. H.



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The German Submarine "U-9" Running Partially Submerged: This Vessel is Credited with Having Sunk, Single-Handed and within the Space of an Hour, the Three British Cruisers "Aboukir," "Cressy," and "Hogue"

main charge of guncotton. To prevent all danger of explosion before the torpedo is launched, the plunger is securely held away from the charge by a pin which must be removed just before the torpedo is placed in the tube. The torpedo is launched from the tube by compressed air, but the instant it enters the water it begins operations independently. So perfectly has all the controlling apparatus been worked out that it is now possible to launch a torpedo broadside from a ship and have it turn at a right angle after entering the water and go straight ahead or straight astern.

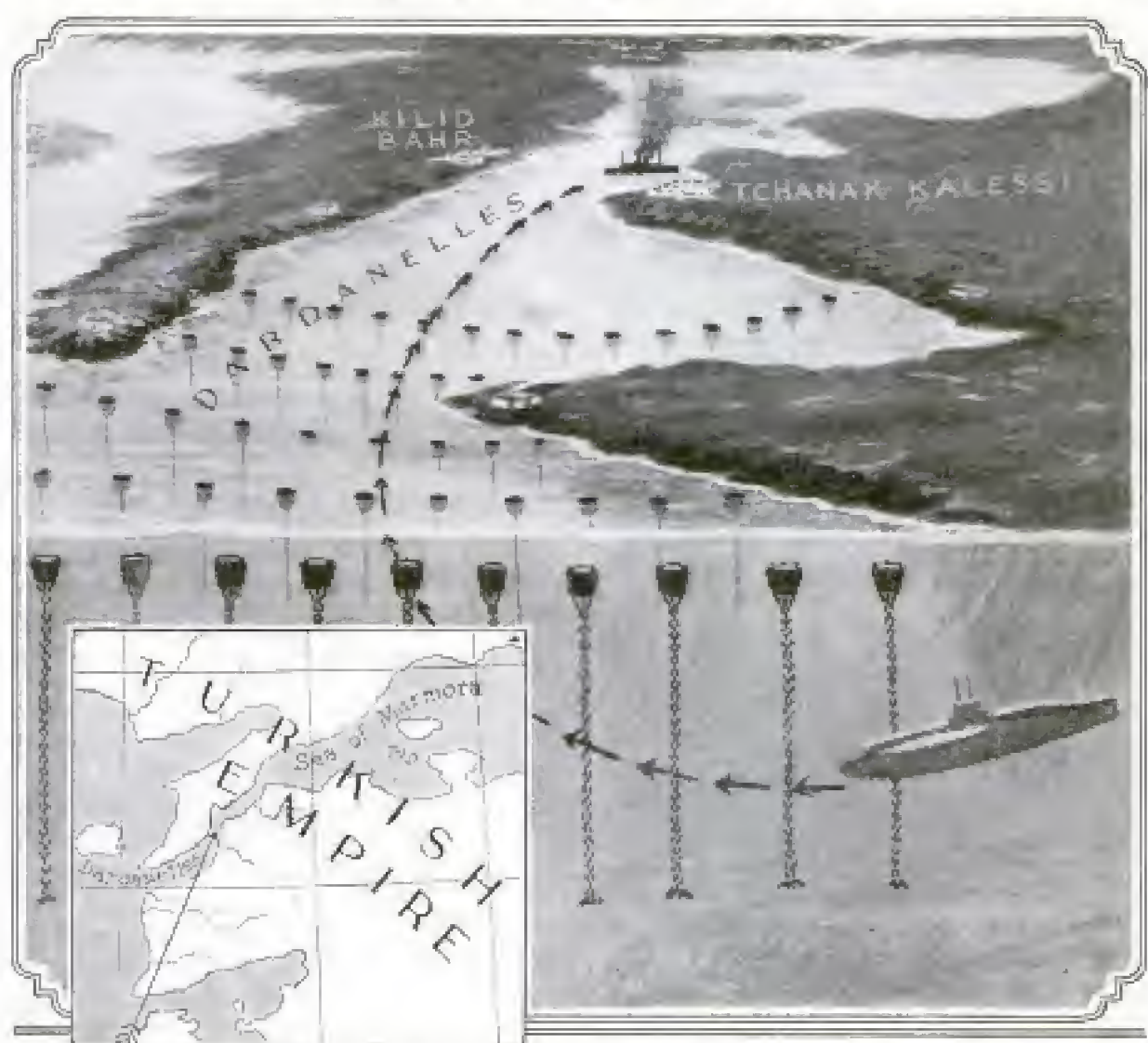
A single torpedo costs about \$8,000, and this accounts for the fact that a recent test shot fired by a United States war vessel was the second torpedo with service charge ever fired by any vessel

of the United States Navy. This was done at the Newport torpedo station for the purpose of testing a new device for destroying torpedo nets. The twisted remains of the exploded torpedo were recovered and preserved for study.

In spite of the deadly menace of the submarine there is such a thing as an effective defense against it. For a ship under way, high cruising speed and frequent change of course constitute the principal defense. Added to this are rapid-fire guns and a constant lookout from the ship and from aeroplane scouts. Where the ship is accompanied by torpedo boats or destroyers, these are constantly on the alert to ram and sink a submarine the moment its periscopes are seen. One weakness of the submarine is its low speed when sub-



The Nose of This 18-Inch Torpedo Carries about 250 Pounds of Wet Guncotton, Enough to Blow a Hole in Any Ship. Next to This is the Compressed-Air Tank, While Back of the Tank Is the Intricate and Delicate Mechanism That Drives the Propellers and Controls the Rudders



Arrangement of Mines in the Dardanelles and Location of the Turkish Battleship "Messudieh" When Sunk at Anchor by the British Submarine "E-11": In Performing This Remarkable Feat the Submarine Was under Water Continuously for About Nine Hours. The "E-11" Running with Its Decks Submerged is Shown Below



Engel Copyright International, 24-47 Street



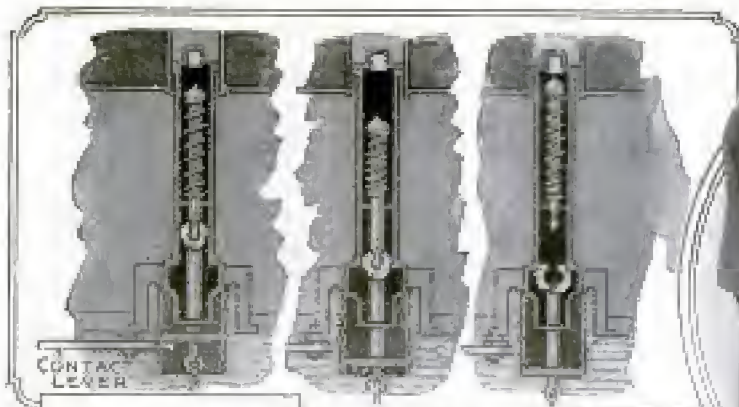
"Creeping" for Mines in the North Sea: Not Less Than Half a Dozen British Trawlers have Already been Sunk in This Dangerous Service

merged. For this reason such a vessel cannot give chase to a warship. It cannot make its escape by running away without coming to the surface, where it is exposed to gun fire. Its only chance for a successful attack is in lying in wait for a ship that is under way, or in stealing in close to a ship lying at anchor. The range for firing a torpedo successfully, however, is not so great as might be supposed, in comparison with the range for successful battleship action. A hit is almost certain at a range of 700 or 800 yd., while 1,500 yd. is considered a good range. Some of the submersibles now being built are designed for firing at a range of from 7,000 to 10,000 yards.

When a battleship is at anchor, defense is likely to be a much more difficult matter. Such protection as is possible is provided by mine fields, heavy-chain entanglements, and by steel torpedo nets, suspended from spars and floats around individual ships. This protection is not always effective. Both the "Audacious" and the "Messudieh" were sunk while at

anchor. In the case of the "Audacious" the attack occurred at the principal naval base of the British navy where there was a fleet of battleships and where there was undoubtedly a flotilla of scout boats on guard. With the latest type of torpedo even the steel netting is no longer effective as a defense. The new 21-in. torpedo that has been adopted by the United States Navy is equipped with a secondary war head that blows a hole in the strongest steel netting without setting off the main charge, and permits the torpedo to pass through. The first charge is fired by contact with the netting. This explosion lights a time fuse that explodes the main charge after a given interval of time.

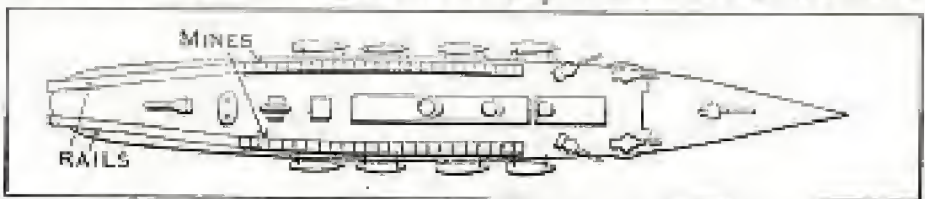
Although it cannot make a definite attack on a ship, the submarine mine is perhaps the greatest menace of all to battleships and other surface vessels, and up to the present stage of the war more ships have been sunk by this means than by the submarines with their torpedoes. Three kinds of mines are in common use, and all are so deadly in their effect that there is little hope for a ship that even brushes against any one of them. The one in most common use is the trigger mine, which is usually anchored at a depth of 15 ft. below the surface. The method of anchoring a mine of this class is shown in one of the illustrations. When the mine is in place, the trigger projects out from one side. A ship striking the trigger pushes it to one



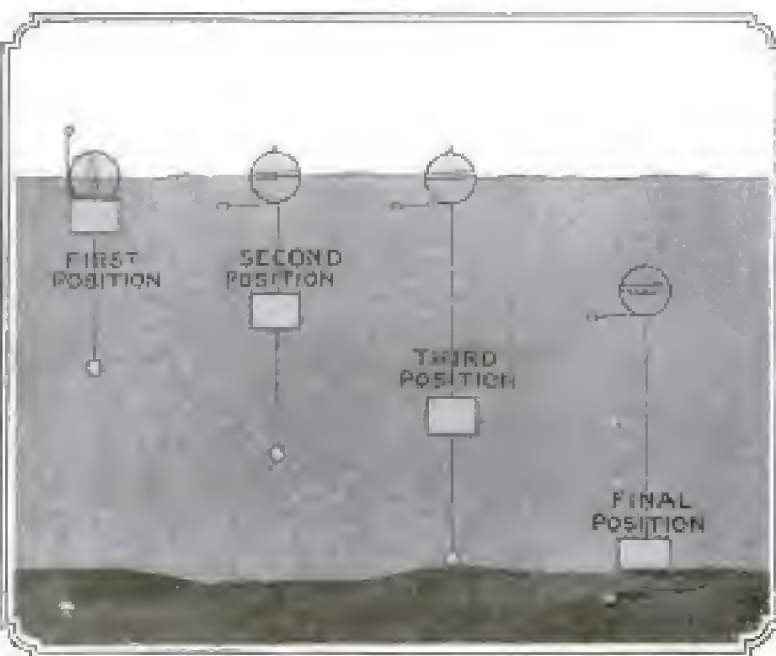
When the Trigger is Pushed to One Side the Spring Plunger That Fires the Mine is Released through the Pull on the Anchor Rope



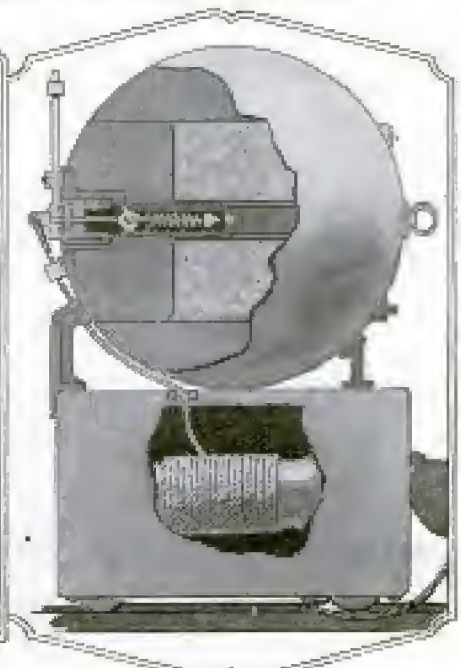
Drifting Mines Float on the Surface and are Connected by a Buoyant Cable; a Ship Striking One of the Mines or the Cable is Almost Certain to be Sunk



How the Mines are Stowed Away on the Deck of a Mine-Laying Ship



The Four Stages of Laying a Mine: In Its Final Position the Mine is Held About 15 Feet below the Surface, with the Trigger Standing Out Horizontally



How the Mine is Nested on Its Anchorage When Stowed Away on Board Ship

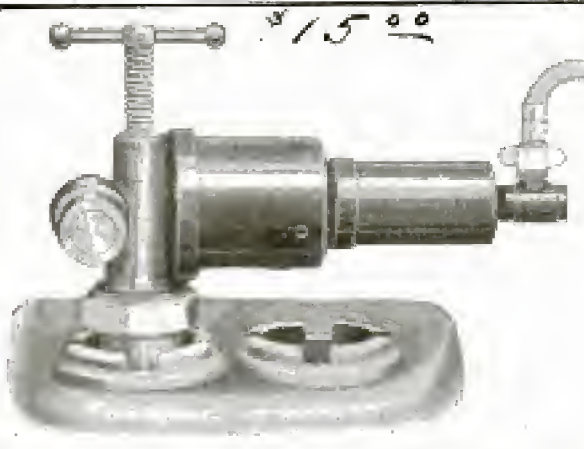
side and releases a spring-actuated plunger that explodes the detonating charge. The mine responsible for the destruction of the cruiser "Amphion" is said to have been what is known as the "contact" mine. A mine of this type is globular in shape and is studded with small leaden spines. Each of these spines is in contact with a glass receptacle filled with acids and placed within the mine. When one of them is struck the glass receptacle is broken and the acids, flowing into a chamber containing chemicals, set up an action that explodes the gun-cotton. The electro-contact mine is suited only to harbor defense. It is exploded by the closing of an electric circuit from a station on shore, and for this reason is dangerous only to the enemy's ships. The electric control of this type of mine has been developed to a high degree of perfection. In the latest installations a number of mines are grouped together on one electric circuit. When one of the mines is struck an electric bulb is lighted in the shore station. Then when the operator closes the electric switch this mine, and this mine alone, is exploded. The only way of clearing a mine field is by "creeping." This is done by two

trawlers which drag between them a sagging chain, the purpose being to explode the mines by dragging the chain against them at a safe distance. The work is extremely dangerous. Not less than half a dozen British trawlers have already been sunk by striking the mines that they were attempting to destroy. The drifting mine with which the North Sea was said to have been studded at the beginning of the war is a contact mine of any type that floats on the surface. Such mines are arranged in pairs and connected by a floating cable so that a ship striking either of the mines or the cable is practically certain to be destroyed.

Just what the submarine strength of the warring nations was at the beginning of the war is not definitely known, but according to the best authority available, England and France each had 78 submarines and submersibles, Russia 37, Germany 24, and Austria 6. This gave the allies a total of 193, and Germany and Austria a total of 30. By this time, however, these figures have undoubtedly undergone a great change, as all the belligerents have been and are still busily at work building more and larger submersibles.

TIRE PUMP FOR MOTOR CARS 67 ATTACHED TO ENGINE

Designed to be permanently screwed into the valve cap of one of the cylinders of an engine, a pump for inflating



Tire Pump for Motor Car Which is Permanently Attached to the Valve of an Engine Cylinder

motor-car tires has been invented which, when once installed, is always ready for immediate use. In employing it, it is only necessary to attach a rubber hose to a tire and then open a poppet valve in the pump by pressing down a plunger, and locking it by a quarter turn. The pump is operated by the suction and compression in the engine cylinder to which it is connected. Air is admitted to the cylinder through a valve by the suction created by the descending piston, instead of gas entering from the carburetor. This in turn is forced into the pump on the return stroke, where it is compressed by a second piston and forced into the tire. A pressure of 150 lb. is obtainable, while a 34 by 4-in. tire can be inflated to a 75-lb. pressure in approximately three min-

mayo Mfg. Co.
54.60 East 18th St.
Chicago, Ills.

utes. The pump is stopped by again turning the plunger, which unlocks it and closes the valve, cutting out the device so that gas is again allowed to enter the cylinder, which then resumes firing in its regular turn.

GAS CONSUMPTION CONTROLS

8635 ACETYLENE GENERATOR

Designed particularly for welding purposes, an acetylene generator has been invented with a feed mechanism which is directly controlled by the consumption of gas, so that it is automatically started or stopped when the flow is turned on or off. Measured quantities of carbide, varying in amount according to the volume of gas being used, are dropped into the water by the action of a motor that is driven by the gas passing from the generator



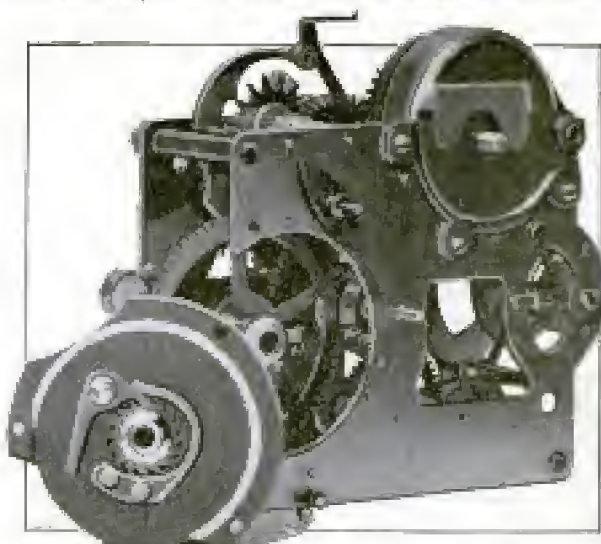
into the service pipe. The greater the amount of gas burned, the faster the motor is driven, which in turn causes larger quantities of carbide to be released by the feeder. In order to insure safety in operation, it is so arranged that should the pressure become greater than normal, the gas would be turned through a by-pass and the feed device rendered inoperative until the pressure were lowered by consumption of gas.

MAINSRING OF ALARM CLOCK WHICH IS EASILY REMOVED

8871 A new feature of alarm-clock construction is a cartridge mainspring, which makes it a simple operation to repair such a timepiece when this part of the mechanism is disabled. Very frequently the source of trouble in clocks of this type is found to be in the mainspring, and in the past the arrangement of the works has been such

Western Clock Co.,
La Salle, Ills.

that it was hardly worth while attempting to make repairs. One company, however, has altered the works so that



The Mainspring of This Alarm Clock may be Removed and a New One Inserted without Difficulty

this spring is easily accessible and may be replaced without difficulty. Dealers are provided with extra springs so that in case of trouble the clock may be repaired by merely removing one cartridge and inserting a new one.

ODD MECHANICAL TOY USED AS ADVERTISING NOVELTY 8866

A performing snake which wiggles and dances much to the delight of children is a toy which has been introduced as an advertising novelty. A metal serpent darts back and forth over the flat surface of a case that houses a top, the magnetized pinion of which extends through the cover. When this protruding shaft is revolved rapidly a light piece of metal, shaped and colored to represent a snake, clings to it and is carried in first one direction and then another, squirming in quite a life-like manner.



Interest in Brazilian diamond fields has been stimulated as a result of the European war.

Logan Sales Agency (Adv)
3664 Milwaukee Ave.,
Chicago, Ills.

Advt. by
Logan Sales Agency, Inc.
Chicago, Ill.

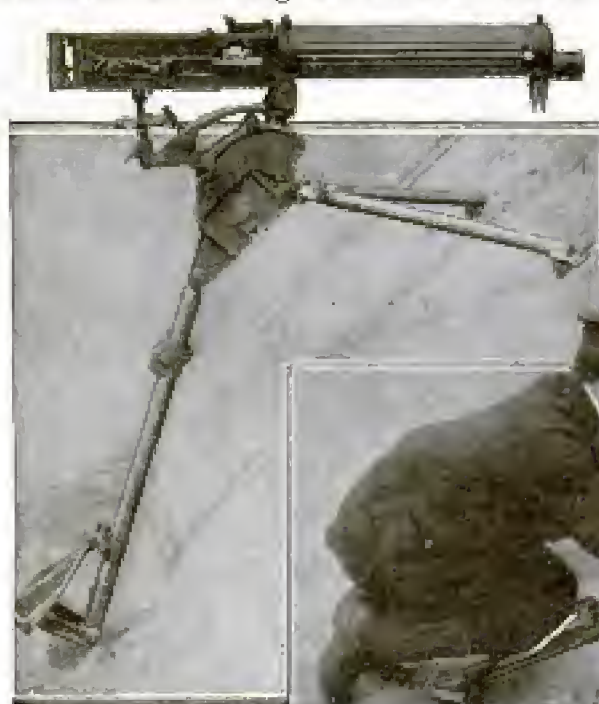
WATER-COOLED MACHINE GUN ADOPTED FOR U. S. ARMY

8996 H

After conducting a series of tests the War Department has adopted for the United States Army the British, water-cooled, automatic machine gun, a large number of which are being used in the present war by several of the European armies. The weapon is adapted not only for general military service, but may also be used either with or against air craft. It is operated by recoil and has a maximum firing speed of approximately 500 shots a minute. While this is somewhat slower than the air-cooled gun now in service, it is contended that in reality it can fire a greater number of shots in a given period than its predecessor, because the time consumed in inserting the short feed strips used by the latter gun is saved. The regulation .30-caliber cartridge employed by all of the service rifles is also used in this gun, which has an effective range varying from 1,500 to 1,800 yd. The ammunition is fed into it by means of belts holding 250 rounds each. These pass through a slot between the muzzle and the firing and recoil mecha-

nism in the breech, the back pressure from the initial shot ejecting the empty cartridge, withdrawing a fresh one from the strip and inserting it in the chamber, where it is automatically fired. This operation continues at a split-second rate so long as pressure is exerted against the trigger. The barrel is incased in a water jacket which prevents it from becoming overheated. This is refilled from time to time during heavy firing. When the supply of water is limited, an apparatus is employed which condenses the steam generated in the jacket and allows the water to be used over and over. The weight of the gun is 36½ lb., and that of its adjustable tripod approximately 40 lb. This latter member has two short legs at the front and a long one protruding in the rear, all of which telescope. The level is changed by raising or lowering this rear leg and turning an adjusting gear. When the weapon is used at its highest position, 32 in., the operator sits on a saddle attached to the tripod. It has been recommended that this mounting also be used with the air-cooled guns now in service. Such of the guns as are to be used probably will be manufactured in this country.

Street-railway companies of Detroit and Cleveland are trying a plan of placing conductors at crowded corners to collect fares before patrons enter the cars.



British Machine Gun
Which Is of the
Water-Cooled Type,
Adopted for the United
States Fighting Forces





One of the Wing Dams Built on the Ice of the Upper Mississippi River in the Government's Work of Deepening the Channel

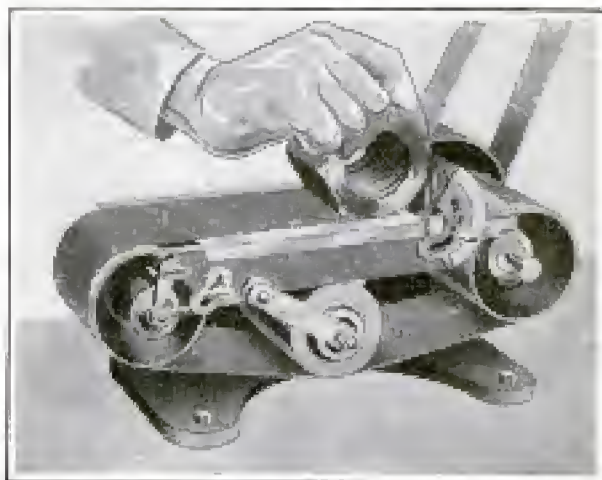
BUILD WING DAMS ON ICE OF 8982# UPPER MISSISSIPPI

In carrying out its work of deepening the channel in the upper part of the Mississippi River, the government is constructing scores of wing dams out from both shore lines in order to restrict the waters and prevent a spreading of the river bed. In the past this work has been done with boats during the season of open navigation. Engineers this last winter, however, took advantage of the ice by building the dams on top of it over the shallows where access would be difficult at other times. These were built up with alternating layers of willows and rock to the required height and, in some cases, left to drop by their own weight at the first thaw. Frequently, however, the ice has been cut around them. Besides being a time-saving method, this form of construction is much more economical than that of building the dams from barges.

¶The virtual completion of a railway circling the Gulf of Bothnia has materially improved transportation between Petrograd and points on the Swedish coast.

SURFACE-GRINDING MACHINE 8521# USES ABRASIVE BELT

Designed for polishing metal as well as wood, fiber, and rubber, a new surface-grinding machine has recently been invented which employs an abrasive belt in lieu of a revolving disk. In construction it is simple, its essential parts consisting of a mounting carrying two cylinders and an idler wheel about which a flint or garnet-cloth belt operates, passing over a metal plate, or table, to which an angular brace is fixed for holding the work. The polishing band is made of



New Surface-Grinding Machine Which may be Used in Polishing Many Different Materials

*Callender and Co., Ltd.
61 Broadway, N.Y. City*
Copyrighted material
Metal Industries

*Harold M. Sawyer
Spalding Bldg.,
Portland, Oregon*



Stairway in a Portland, Ore., Park Cut in a Fallen Fir Tree

fabric woven in one piece so that it is without a seam. This may be fitted in place in a moment's time, so no difficulty is encountered in changing from one to another. No particular skill is required in using the apparatus, while great freedom is given the worker by the fact that all the parts are below the table where they cannot interfere with the article which is being ground.

CONVERT FALLEN FIR TREE INTO LONG STAIRWAY

8976

By a rather peculiar coincidence a giant fir, which was blown over in one of the parks of Portland, Ore., during a severe storm, fell along a steep, slippery path where it previously had been decided a stairway was needed for safety. Instead of attempting to remove the tree, it was left where it had fallen and steps were cut along its trunk, thus providing the required stairs. The length of the trunk from end to end is slightly more than 100 ft., while its diameter varies from approximately 5 ft. at one extremity to 3 ft. at the other. Fifty-seven steps were cut, each with a length of about 2 ft., a width of 11 in., and a rise of 6 in. A rustic railing was constructed along either side from the limbs trimmed from the trunk.

SEARCHING COTTON BALES FOR INFERNAL DEVICES

9021

Following the discovery at New Orleans of a plot to destroy a British mule transport, which was sailing for France, by placing an automatically timed infernal machine in its hold, extreme precautions are being taken in order to frustrate any similar attempt which may be made by aliens in this country. In carrying out this work, every bale of cotton contained in shipments billed for ports in belligerent countries is being inspected by means of X-rays before it is allowed to be placed aboard a vessel. The bales are carried on trucks before these instruments and examined care-

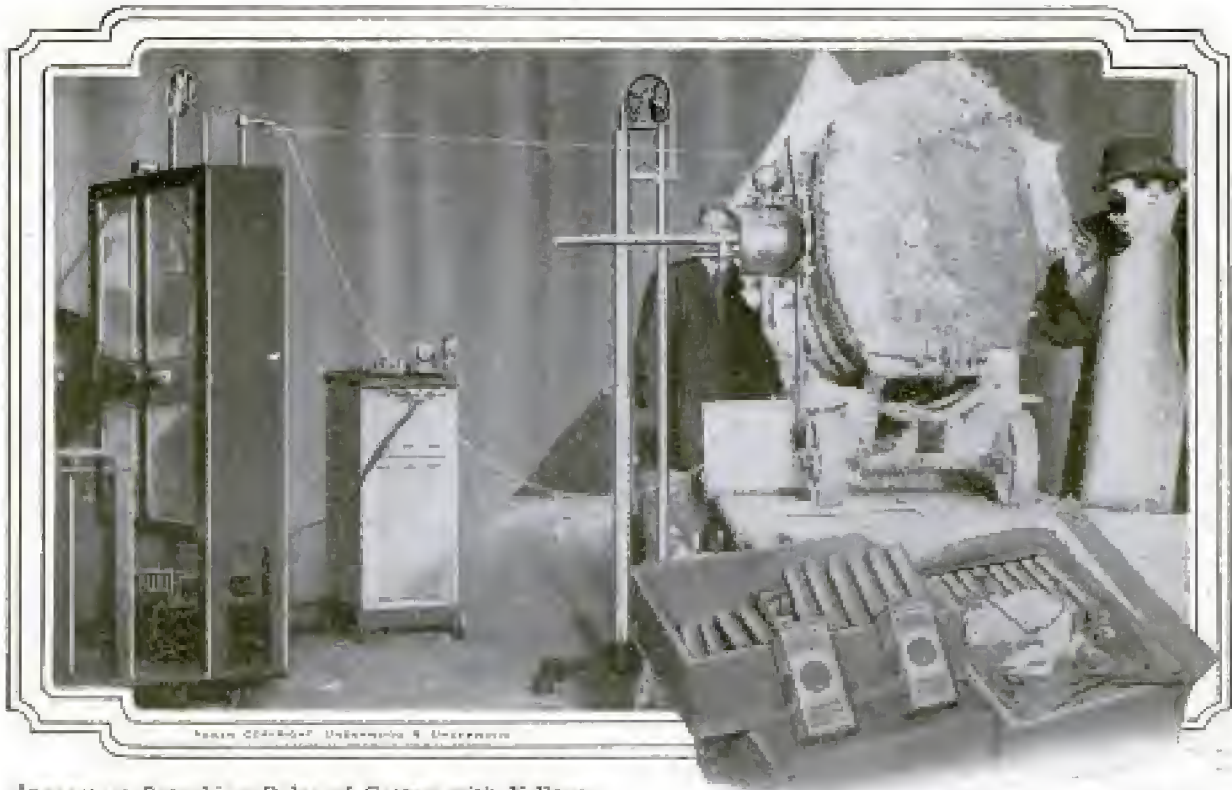
Underwood & Co.

17-18th Ave., N.Y. City

*Louis A. Dodge, 4528 Danneel St.,
New Orleans, La.*

photo of infernal machine

Copyrighted material

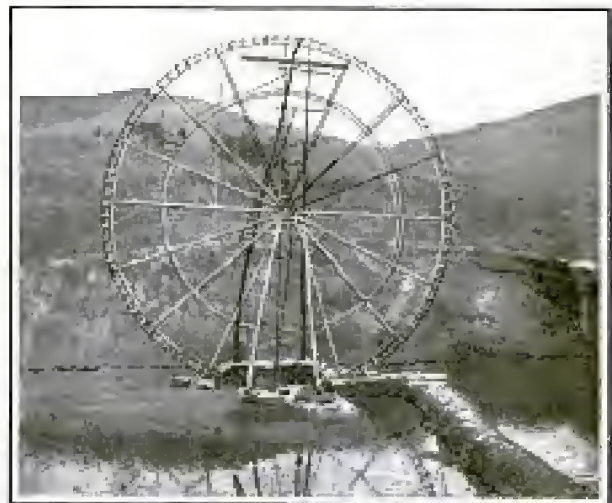


Inspectors Searching Bales of Cotton with X-Rays to Frustrate Attempts to Destroy Vessels of Foreign Register by Placing Infernal Machines in Their Cargoes

Seventy-Five Pounds of Dynamite, Timed to Explode in Six and a Half Days from Sailing, Which was Intended to Destroy a British Mule Transport

fully prior to being passed by the inspectors. Were it not for this, it would be a very simple operation to conceal enough explosives in a single bale of cotton to sink, or at least set fire to, a merchant ship. The infernal machine that was discovered by secret-service agents, and which has led to these precautions being taken, contained 75 lb. of dynamite. This was packed in a heavy box in which a clock, electric batteries, and detonating caps were arranged so that an explosion would occur six and a half days after the vessel left port. The box was ready for shipment when it was discovered, and its maker, a German, arrested.

through a flume, being sufficient to revolve the wheel and to lift the water in small bamboo cups to a trough that leads to the bamboo aqueduct. Although no metal nails were used in its



A Water Wheel in Southern China Which Lifts the Water Nearly 50 Feet to a Bamboo Aqueduct

CHINESE WATER WHEEL OF ENORMOUS SIZE

At one point in southern China there is an old water wheel of enormous size used for lifting water about 50 ft. to a bamboo aqueduct which carries the water to an irrigation ditch for rice culture. The wheel is self-operating, the swift flow of the stream, diverted

construction, the wheel runs true after having been in use for many years.

Flag Island, Me., has been offered to the government as an aeroplane landing station.

Geo. F. Worts.

Frank C. Perkins, Erie Co. Savings Bank Bldg., Buffalo, N.Y.

Mfrs: Pawling & Harnischfeger Co., Milwaukee, Wis.

344

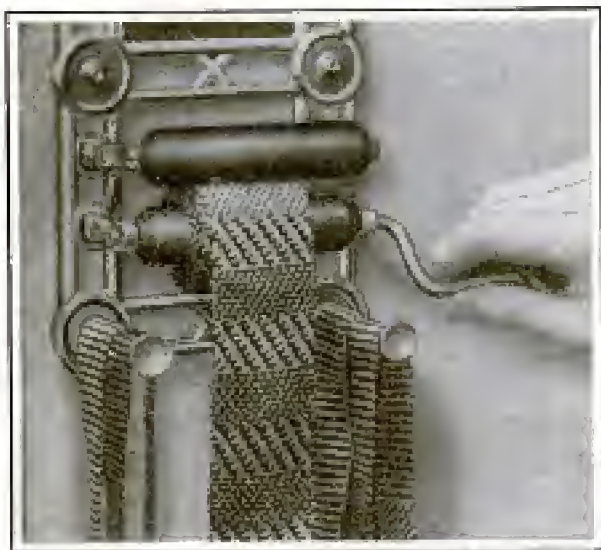
POPULAR MECHANICS



A Trench-Digging Machine That is Propelled and Operated by Gasoline Power

8883 ^{Necktie} PRESSING DEVICE COMBINED WITH TIE RACK

Combined with a rack for men's cravats, a roller device is being made which smooths out the wrinkles from neckwear. At the top of the fixture is a mirror, beneath which is a pair of rollers, the upper one provided with strong springs which tend to press it against the other member. When a cravat is wound tightly about the lower cylinder and left until the following morning the wrinkles from the previous day's use are eliminated.



A Tie Rack Which Provides a Means for Keeping Neckwear Freshly Pressed

The Fisher Knitting Machine Co.,
Utica, N.Y.

8559 TRENCH DIGGER DRIVEN AND OPERATED BY GASOLINE

Among the many types of excavating machines that have in recent years made digging by hand an uneconomical process is a trench digger propelled and operated by gasoline power. The digging wheel of this machine is of steel and is rotated by steel pinions working on a rack placed on the inner side of the rim. The buckets fixed to the rim are of steel, with sharpened edges and tool-steel teeth. An endless-belt conveyor is used for catching the dirt as it falls from the buckets and depositing it at one side of the trench.

9094 NEW STYLE OF MEN'S SHOE HAS ELASTIC TOP

A shoe, the top of which is made entirely of rubber-and-cotton webbing like the fabric used for the elastic gores of congress gaiters, is one of the late styles in footwear for men. In appearance it is the same as the ordinary cloth-top buttoned shoe, but the buttons are merely decorative, the whole top stretching to admit the foot. One advantage claimed for the new shoe is that it offers a better fit than is usually possible with button shoes.

Ladies Rubber World
Mfrs. Hub Gore Makers
Boston, Mass.

G. E. Drayer
1801 East 93rd St.,
Cleveland, Ohio.

POPULAR MECHANICS

The Sentinel Automatic Gas
Appliance Co.,
New Haven, Conn.

345

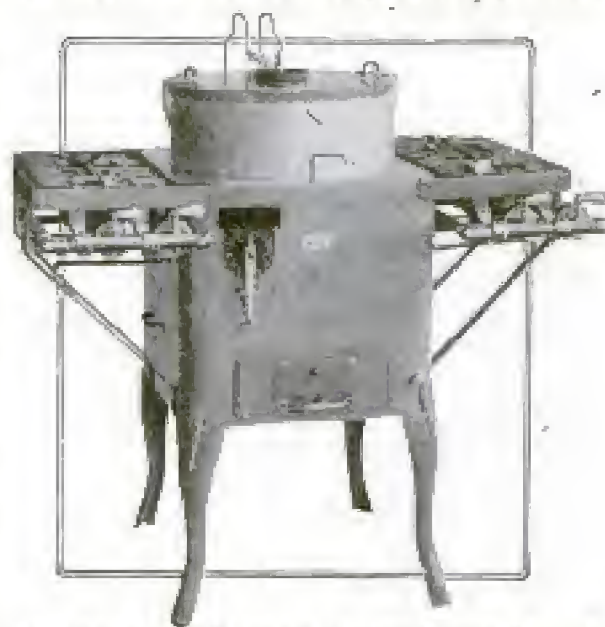
LARGE BUILDING IS MOVED EIGHT MILES OVER WATER

An unusual piece of house moving was recently accomplished at Cleveland, Ohio, when a three-and-a-half-story building, occupied by a yacht club, was blocked up on barges and towed eight miles over Lake Erie to a new site on an island in Rocky River. The structure is 52 by 18 ft. in size, and placed an aggregate weight on the three scows which were employed of approximately 310 tons. The largest of the barges, 40 ft. wide and 120 ft. in length, was lashed in the middle and supported 80 per cent of the load. When the scows had been prepared to receive the building a timber runway was built between them and the structure. A steel cable was then stretched across a cove, some 100 ft. wide, in front of the club, to a capstan. With the assistance of block and tackle, this was turned by a single horse, pulling the building up a 10-per-cent grade onto the scows. In six hours the house rested on the blocks and everything was ready for the tugs, while only about two hours' time was consumed in towing it to its new location in the mouth of the river.



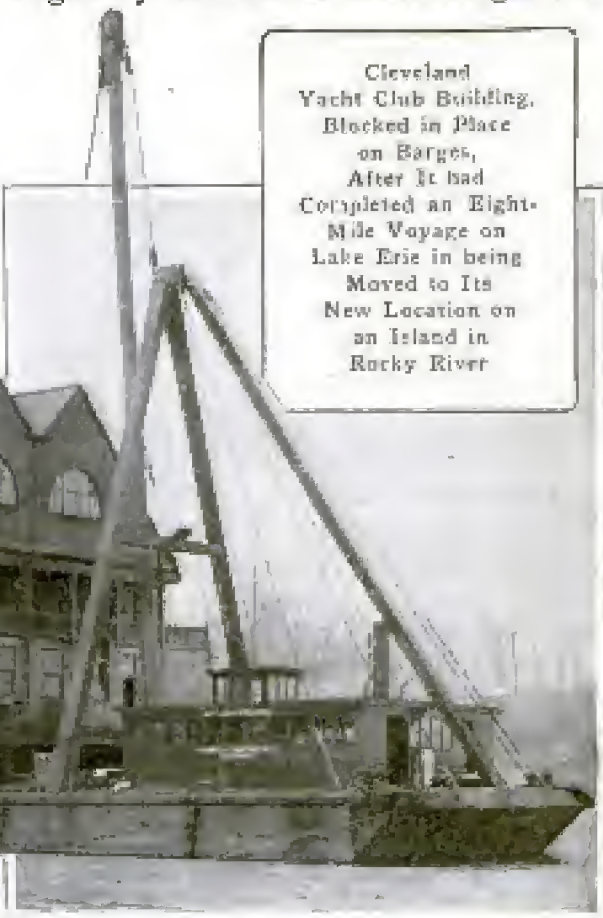
AUTOMATIC GAS STOVE AND FIRELESS COOKER

Automatic control is the principal feature of a new combination gas stove



Combination Gas Stove and Fireless Cooker Equipped with Timer for Automatically Extinguishing the Fire at the End of a Given Time

and fireless cooker. The cooking is begun by direct heat from the gas and



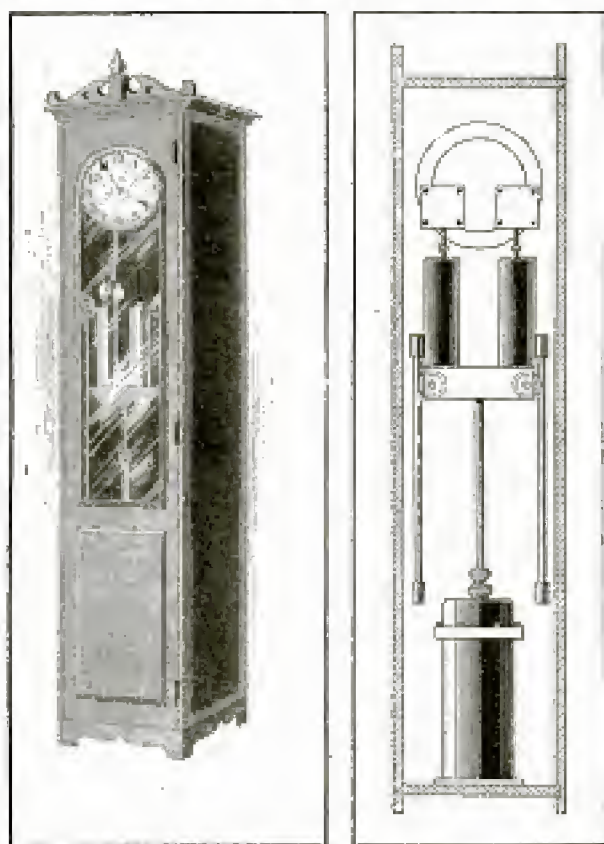
Cleveland Yacht Club Building, Blocked in Place on Barges, After It had Completed an Eight-Mile Voyage on Lake Erie in being Moved to Its New Location on an Island in Rocky River

*Arch Macdonald
280 Lee St.
Oakland, Calif.*

this is continued until the food is browned. At the proper time the fire is extinguished automatically, and the remainder of the cooking is done by the heat retained in the compartment. This is accomplished by means of a timer which may be set to shut off the fire at the end of any given time.

SELF-WINDING CLOCK RUNS WITHOUT ATTENTION

8367 Operated by a thermal motor, a clock has been devised which under favorable atmospheric conditions is



A Variation of Five Degrees in Temperature will Keep This Clock Running

capable of running indefinitely without any attention being given it other than an occasional resetting for time correction. The winding is effected by means of weights which are raised by the piston of the motor, the action of which depends upon a variation in temperature. Its cylinder is filled with two liquids, one of which is heavier than the other and has a greater coefficient of expansion. When the temperature of these liquids is changed so that they expand, the

heavier one is forced to raise the piston in order to escape. A subsequent drop in temperature, causing a contraction of the liquids, allows the clock weights to descend and thus wind the coil springs. The piston is prevented from rising too far by providing an overflow outlet, through which the heavy liquid is allowed to flow into a reservoir at the top of the motor. From this chamber, however, there is a feed duct leading to the cylinder, which allows the liquid to return to that receptacle when the pressure is lowered by the contraction of its contents. This makes the operation of the motor automatic. A temperature variation of 5° every 24 hours is sufficient to keep the instrument running.

HOUSEHOLD GOODS SHIPPED BY PARCEL POST

8770 "Moving" by parcel post is the latest of novel uses to which this service is being put. This plan was used by a family in shifting their home from a town in Nevada to Grass Valley, Cal., and it is said to have resulted in a considerable saving in transportation charges. The furniture could not be shipped in that way, since it did not come within the 72-in. limit prescribed by the Post Office Department, but all the smaller articles were packed in square boxes and turned over to the mail man. When the shipment reached its destination the owner backed his wagon up to the post office, loaded his boxes and hauled them to his new home.

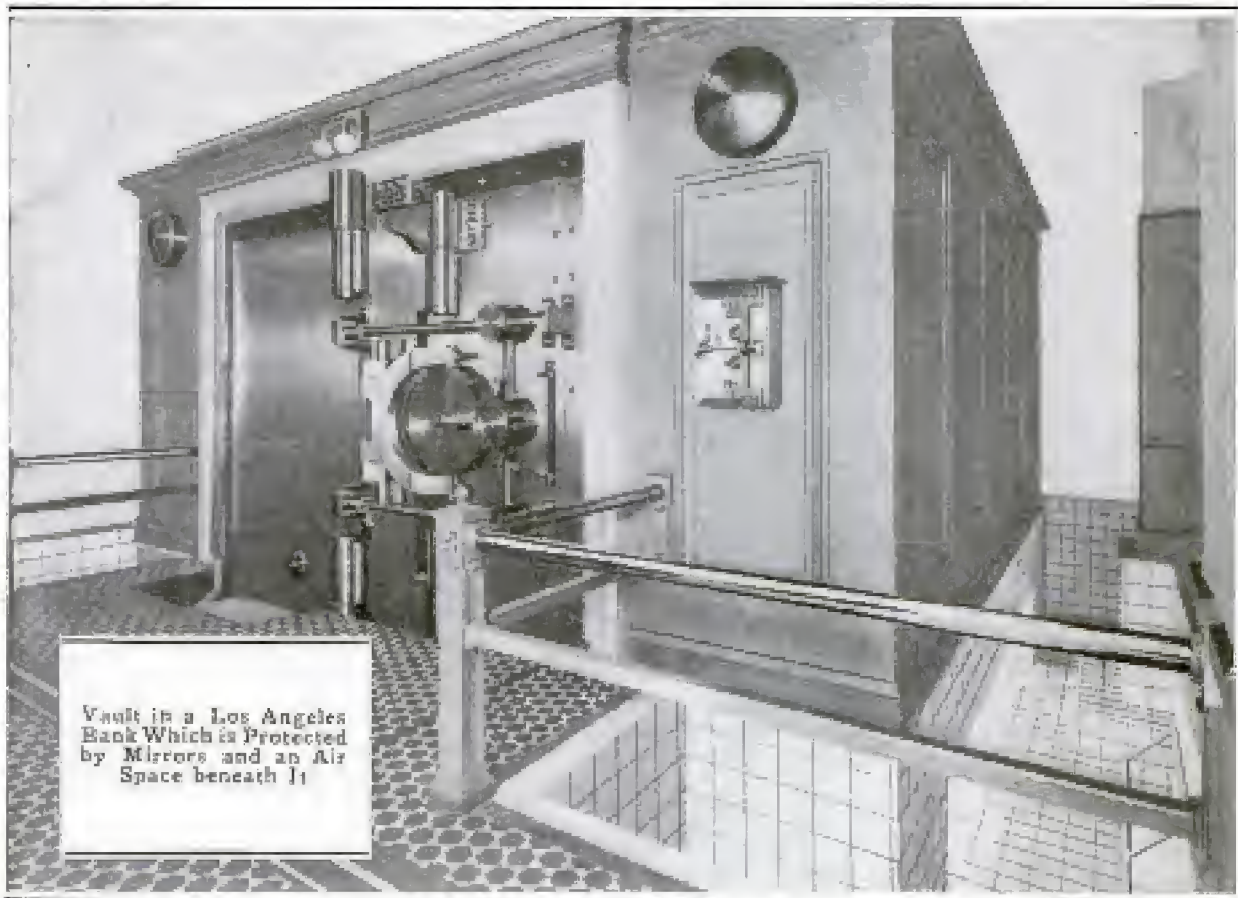
BANK VAULT IS PROTECTED BY SYSTEM OF MIRRORS

8975 In constructing a vault in the basement of one of the Los Angeles banks, a plan has been followed which makes the six sides of the chamber visible to a watchman and eliminates all chances of its being entered by tunneling beneath it. It is set on concrete columns in the middle of a white-tiled pit which is brightly illuminated. To

*C. L. Edholm
1353 West 36th Place
Los Angeles, Calif.*

Copyrighted material

*Inventor & Contributor
A. G. Schweikerman
330 Heyer St.
Dayton, Ohio.*



make it possible to command a view of the space beneath the vault, from the level above, mirrors have been arranged on the floor at such an angle that every part of the space is reflected in them. Light is reflected by the white walls so that the top of the vault is illuminated and easily inspected.

CONVENIENT FORM OF APPLE-

8566H PICKING SACK

An apple-picking sack, which enables rapid work and careful handling of the fruit as it is taken from a tree, is used in an Indiana orchard. It consists of a folded bag, with both ends open, and is secured to the wearer by means of straps which pass over the shoulders. The top and bottom ends are brought together, as the bag is folded at the middle, and held in that position by means of hooks and rings. The top of the bag is bound by a heavy wire, semicircular in shape, which holds it open. As it commences to be filled, the hooks are taken from the top

and inserted in the middle rings so that additional capacity is provided. When it is time to empty the sack, the hooks are merely unfastened, and the apples allowed to fall through the open end.



Apple Picker's Sack, Showing How It Appears When being Filled, and How It is Emptied

Lola A. Pinchou, Seymour, Ind.

*Invented by James Jackson, Kingston Apple Orchard
Seymour, Ind.*

*Prometheus 8-15-14***MOUNTAIN-RAILROAD WRECK****CARBONIC ACID EMPLOYED****8512 HAS CURIOUS RESULT****8927 IN PNEUMATIC RIFLE**

§ A railroad wreck that is of interest not only because no one was injured

Compressed carbonic acid is used as the propulsion medium in a new pneumatic rifle recently invented in Germany. The acid is contained in a small cylinder, or cartridge, which holds a quantity sufficient for from 100 to 800 shots, according to the caliber of the gun. By pulling the trigger a valve is opened which allows the gas to pass from the tank into a small cylinder from which it drives the bullet or shot. When shot is used in the rifle, the range for accurate



Peculiar Train Wreck on a Colorado Railroad in Which No One was Injured

but from the peculiar position assumed by the locomotive, as if it had simply decided to stop and rest a while, occurred on a Colorado railway recently. Late at night, as the train was rounding a mountain curve, the engineer saw a pile of rocks on the track ahead, a landslide having occurred a few minutes before. The brakes could not prevent the locomotive from striking the rocks, but although the engine's cab was entirely demolished, not even the engineer or fireman was hurt, while many of the passengers in the sleepers were not even awakened.

PERMANENT GARRISON FOR THE PANAMA CANAL

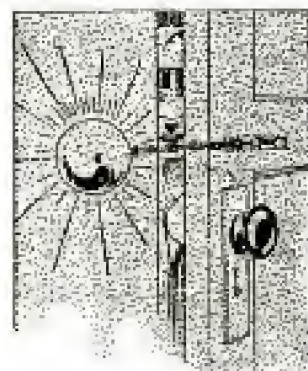
8473 According to the plans of the War Department the Panama Canal is to be fully garrisoned at the earliest possible date, as the rapidity with which events have followed each other in the European war has demonstrated that it would be practically impossible to send troops to the Isthmus after a war had been declared or even threatened. This garrison is to consist of three regiments of infantry, one squadron of cavalry, one battalion of field artillery, and 12 companies of coast artillery.

Prometheus 8-15-14

firing is about 80 ft., while with a bullet this distance is increased to approximately 100 ft. The gas cylinder is easily inserted.

BURGLAR LOCK AND ALARM FOR OUTSIDE DOOR

§ A door lock, recently invented, is designed to perform the twofold service of helping to keep a burglar out of a house and giving warning at the same time if one is attempting to break in. It consists of a catch on the inside of a door to which one end of a chain fastens, the other end being attached to the heavy clapper of a gong screwed to the casing. Sufficient slack is left in the chain so that if the door is opened, after the other locks have been picked, the chain is drawn taut with a jerk that rings the bell. The door then cannot be opened farther until the chain is broken or uncaught.



COMMENT AND REVIEW

WITH all the din of discord of war, it is encouraging to catch even an occasional note of harmony. The world, its people, and conditions are never all bad: in the worst years of crop failure there

Harmony out of Discord

is always some scant yield. In no spirit of boastfulness, but merely as an evidence of the brotherhood of man, our people are taking advantage of the opportunity, as state after state fills its ship with food for the starving millions of helpless women and children across the sea. As an expression of gratitude and thankfulness for our own immunity from strife, we should give freely out of our abundance. The value to ourselves in years to come of the Christmas ship will far outweigh all the joy which its contents could possibly bring to the forlorn orphans for whom it sailed. The spirit of friendship and the reaching out of millions of little hands on this side to other millions of little hands across the sea cannot fail to implant in young, impressive minds on both sides the seeds of amity which years hence will bear fruit when these children take on the responsibilities of mature life.

It is ever one of the strange fantasies of war that during moments of intermission the soldiers of two belligerents so easily fraternize. Our own Civil War was full of such incidents; and now there comes to us an account of a football contest between Allies and Germans on Christmas Day, played by soldiers and witnessed by officers and the ranks of both sides. That the interest in the friendly game was so great it was even proposed to postpone hostilities for two days in order to play the game to a satisfactory finish, reveals the great-heartedness of the thousands of individual soldiers and a startling absence of personal hatred. That the kaiser, on learning of the incident, prohibited its repetition on the part of his own men, as detrimental to a proper spirit of enmity between foes, is greatly to be regretted.

Can there be any doubt as to the answer, could a settlement of the present trouble be submitted to the popular vote of the warring nations?



SO much has been done in the campaign for "Safety First" during the past three years, it is gratifying to present some actual figures of tangible results, and this record should go far toward convincing and encouraging those hundreds of thousands of men to whom the sermon has been so widely preached.

Safety- First Results

The figures are found in the recent report of the Pennsylvania Railroad, which during the past year operated 26,198 miles of track and carried 188,411,876 souls without the loss of life to a single passenger. This wonderful accomplishment is better comprehended when we learn that more than one million trains were necessary to transport a total almost twice the entire population of the United States. In two years the lines east of Pittsburgh carried over 311,000,000 without loss of life to a passenger in a train accident.

This splendid achievement was not due so much to massive bridges and careful train dispatching, but was only possible because every man of thousands who are seldom seen and of whom the public never hears, was faithful to his responsibility. A loose spike or two here, a rail brace neglected there, have more than once been the straws which yielded to some unusual strain. Many a switch tender, at some little mountain siding, almost too ill to walk, has fought his way through sleet and snow to place the signal lights in their accustomed place. How many times has a tired rear brakeman, in the middle of a stormy night, where no one would have been the wiser, faithfully gone back the required distance with his red lantern, instead of shirking his duty and taking the chance which ninety-nine times out of a hundred might have worked no harm? The management who plan, and direct, and superintend, are justifiably proud of the record, but also should the thousands of employes take equal pride in their no less important part in this grand result.

This conscientious, faithful observance of responsibility, always and every time, especially when it seems most unnecessary, is a lesson of far more value for our boys and girls to learn than any taught in books; and some of us older persons might well take a postgraduate course with profit.



FOR some years past our production, especially in manufactures, has been gaining on our home consumption. With natural resources which seemed inexhaustible, we treated the future with the same disregard a young man has for life — it appears to be so long and large ahead. Already has come the time when we hoped to send our wares to distant lands, as England and France and Germany have done for years. With a few notable exceptions, and those chiefly very large interests, we have not progressed very far. Hence, when the war occurred, the great uninformed majority immediately declared that now was our opportunity which generous Fate had handed us on a silver platter. South America, the Orient, Australia, and various islands in numerous seas must stretch out suppliant hands for us to fill with all manner of manufactured goods.

*Our
Export
Trade*

That was over six months ago, but thus far the outstretched arms, if any, have not been long enough to bridge the gulf. On the contrary, a great volume of exports previously leaving our shores has been largely curtailed or entirely suspended. Evidently we have yet much to learn.

For many reasons export trade is hard to get and slow to secure. We have judged foreign temperaments by our own. We, who do things quickly and decide important matters in a moment, fail to estimate properly the calm indifference to time characteristic of most foreign lands. We make the wrong approach, and not only fail, but are regarded badly in consequence. Our salesman rushes in, breathless; spreads out samples with the skill of a magician; pulls out the order book, and, pencil in hand, looks expectantly and impatiently at

the customer. Whereas he should have spent a week or more in patient cultivation of acquaintance and, above all things, avoided mention of business until the psychological moment. Our credit system and banking facilities and ships to deliver goods are all in the kindergarten stage, where England and France and Germany are postgraduates.

These conditions, however disappointing, should work to our ultimate advantage. We will be wise to take the lesson seriously and, without further loss of time, set ourselves diligently at work to learn and prepare for the future. The work requires careful and thorough training not only in the language of the country selected, but its history, customs, manners, and etiquette. These things call for young men of ability and perseverance, who are also keen students of human nature—good observers.

To the young man of quality, possessed of these requirements, there are offered great opportunities, but success can only be attained with a lot of hard preparatory work. The reward, however, will be adequate.

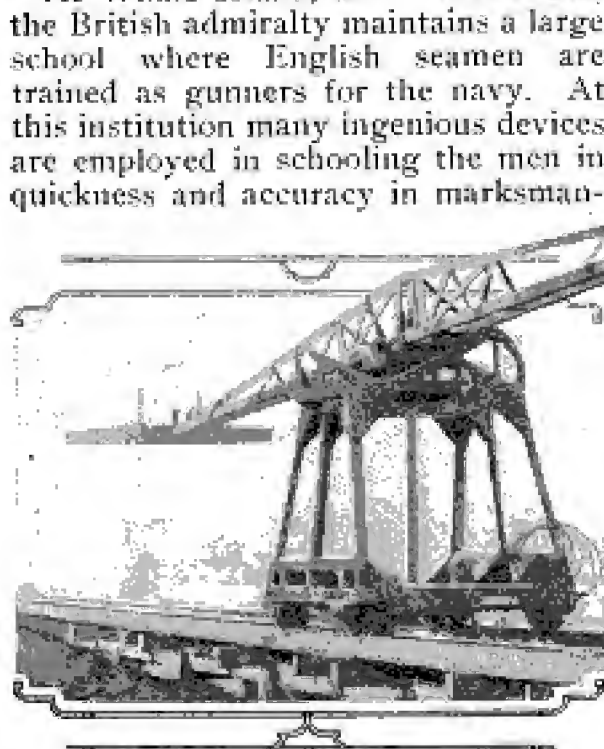
H. H. WINDSOR

January 22, 1915.

DUMMY SHIPS ARE TARGETS FOR BRITISH GUNNERS

At Whale Island, near Portsmouth, the British admiralty maintains a large school where English seamen are trained as gunners for the navy. At this institution many ingenious devices are employed in schooling the men in quickness and accuracy in marksmanship,

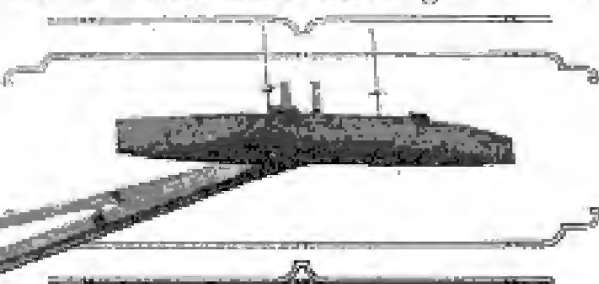
among which is the large moving target shown in the accompanying photograph. Two dummy ships are held at either end of the long structural-



COURTESY OF ILLUSTRATED LONDON NEWS

Moving Targets of This Kind are Used in Training Gunners for the British Navy

Illustrated London News
Nov. 21, 1914



steel crossbar of the supporting apparatus, which is mounted on trucks and operates along a track. These boats are fired at by large guns while they are in motion.

¶The temperatures of 109 stars have been measured by German astronomers. White and blue stars are the hottest, having temperatures up to 9,600°. Yellow stars are cooler than 6,300°, and some red stars are as cool as 3,200° centigrade. Many individual stars are much hotter than any of these, one being estimated at 400,000°.

WINDSHIELD TO PROTECT

90184 TRAFFIC POLICEMEN

As a means of shelter to be used during bad weather by traffic policemen stationed at street intersections,



a windshield has been built and placed in use at Richmond, Va. It consists of a sheet-iron drum slightly less than 6 ft. in height, provided with a wooden flooring, raised several inches above the pavement, and a hinged door. It is also supplied with a large umbrella which affords additional protection dur-

ing rainstorms. The weight of the device is sufficient to prevent it from being overturned by the wind, while its appearance is not such as to frighten horses. Only the head and shoulders of the policeman are exposed, but it has been found that this is sufficient to allow him to perform his duties without difficulty.

8928 TALK HOLE THROUGH BOARD DURING SCIENTIFIC TEST

Literally talking a hole through a board was the unusual feat performed recently in Germany during the course of scientific experiments conducted to ascertain the action of phonograph membranes under certain conditions. The apparatus used in making the tests was so constructed that the force of vibrations of the human voice acting on a recording diaphragm, such as is used in making original records, was made to revolve a drill which in turn bored through a board.

The needle in the center of the thin, vibrating membrane of a transmitter, rested on a lever that operated a

Geclams Universum

ratchet wheel. This gear was fitted with a worm shaft that revolved a larger gear, the shaft of which constituted the drill spindle. This latter member was so weighted that it pressed the drill head against a board. Thus, when a person talked loudly into the phonograph horn, the drill, through the action of the intervening mechanism, was made to bore into the wood. In this way a young woman talked a hole through a board 4 in. in thickness in 15 minutes. Further tests illustrated the varying powers of the voices of different individuals and showed that the feminine voice has a pronouncedly greater effect than the masculine.

88944 CURIOUS SHOVEL MADE BY BOOTHIA NATIVES

The snow shovel shown in the accompanying photograph was made by natives of Boothia from wood taken from the "Victoria," the ship used on one of Sir John Ross' arctic expeditions. The blade is tipped with whalebone, ground to a sharp edge and held in place by thongs, while in the middle is a handle made of walrus tusk and also bound with thongs. This curious implement was presented several years ago to Captain Roald Amundsen, the explorer, who later presented it to a Norwegian club. It was used in breaking the ground for the Norwegian Pavilion at the Panama-Pacific Exposition.



«The metric system of measurement has at last gained a foothold in England, having been adopted in the new edition of the British pharmacopoeia.

Hamilton W. Wright

Panama-Pacific Exposition

San Francisco, Calif. material

9127 m Underwood & U. 417 Fifth Ave. N.Y.C.

RESCUING VICTIMS OF NEW YORK SUBWAY FIRE

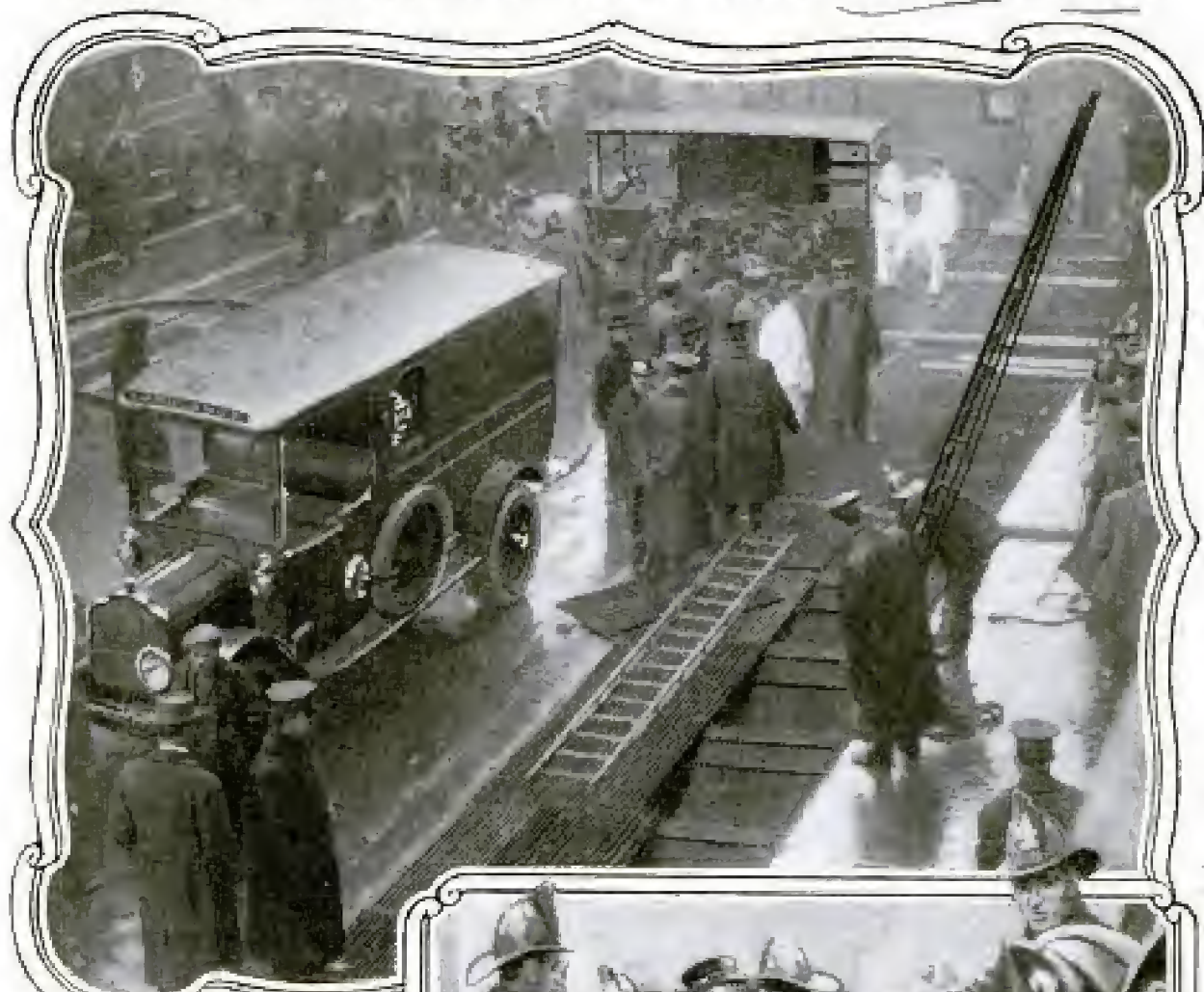


PHOTO COURTESY INTERNATIONAL NEWS SERVICE

THESE photographs show how the fire department was able to give the prompt relief that saved the lives of hundreds of passengers imperiled by fire that broke out in the Broadway subway during the morning rush hour, January 6, 1915. Wherever the street is wide enough, removable covers for emergency access to the subway are placed along the side of the street, and it was through these openings that the firemen brought out most of the victims. The fire was caused by a short circuit among the wires composing an electric feed cable, which heated and set fire to the rubber insulation of the cable. The accident occurred near the point where the feed cables from the power house enter the subway and where the cables contain the greatest number of wires and carry the heaviest current. The greatest danger was not from the fire but from panic and the choking fumes of the burning rubber. One woman was killed and about 172 passengers were so badly injured that they were taken to hospitals.



PHOTO COURTESY INTERNATIONAL NEWS SERVICE

Inspection by J. E. M. See - July '16 - 90-1792 Vista
Literature from " - Jan'y '14 - 85-4761 - Haynes
R. M. Owen & Co., Inc.,
735 3rd Ave. New York

POPULAR MECHANICS

NEW MAGNETIC TRANSMISSION FOR MOTOR CARS

One of the latest developments in motor-car equipment is an electrical apparatus through which the power of

the second unit becomes successively weaker and the magnetic drag of the first unit stronger, until in the seventh and last stage the first unit acts alone as a magnetic clutch, current for energizing the magnets being created

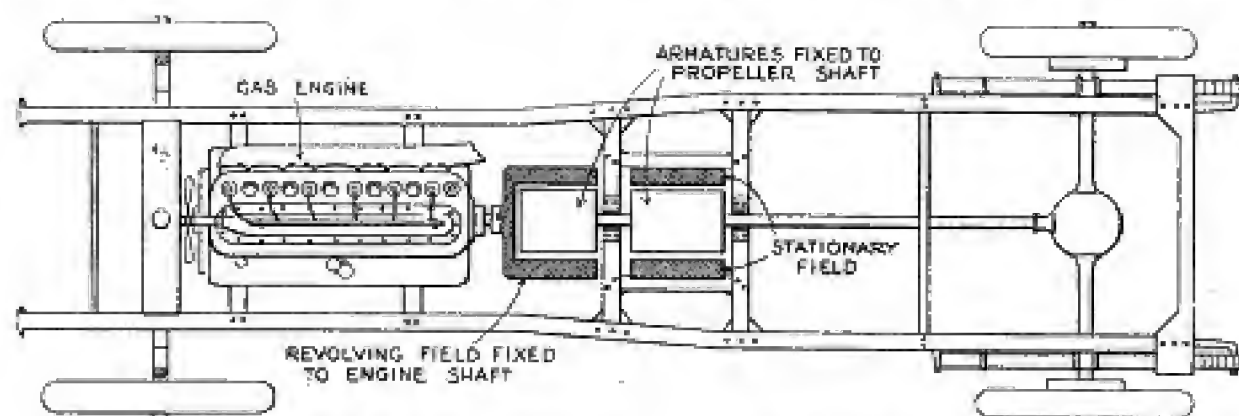


Diagram Showing the New Magnetic Transmission: In This Apparatus Only so Much of the Power of the Engine as is Required for Transmission Purposes is Converted into Electric Force

the gasoline engine is transmitted to the propeller shaft solely by magnetic force, thus doing away with the necessity for gear shifts, or other mechanical transmission. This apparatus differs radically from the ordinary electrical transmission in that only so much of the power of the engine as is required for transmission purposes is converted into electrical force. The apparatus consists of two electrical units, in both of which the armature is fixed to the propeller shaft of the car. In the first, or forward, unit the field is fixed to the engine shaft and revolves with it, while in the second, or rear, unit the field is stationary and is supported on the frame of the car. In the various stages of operation the first unit acts as dynamo, magnetic clutch, and motor, and the second unit as motor and dynamo. The action of these units is controlled through resistance coils.

With the engine running, the rotation of the field of the first unit about the armature on the propeller shaft sets up an electrical current which is transmitted to the second unit and operates it as a motor for turning the shaft. In this action the first unit exerts a magnetic drag which serves to augment the action of the second unit. By varying the resistance the motor action of

by the slip between the revolving field and the armature on the propeller shaft. The amount of slip required for this purpose is surprisingly small, being estimated at about 50 revolutions in 1,000. In the seventh stage the second unit is idle, so far as the running of the car is concerned, but acts as a dynamo for storing up power in the small storage battery that supplies current for lighting and for starting the engine.

METHOD OF MAKING DUSTLESS CONCRETE FLOORS

A new method of making dustless concrete floors consists simply in spreading dry sand and cement over burlap, laid on the wearing surface coat immediately after it is struck off. Up to the time of applying the burlap, standard specifications are followed. A dry mixture, similar to that used for the wearing course, is spread lightly over the burlap to a depth of about $\frac{1}{2}$ in. It is claimed that capillary attraction takes out the excess of water in the concrete in from 20 to 30 minutes, leaving the surface in perfect grade and ready for final finishing by float or trowel. After being used for this purpose, the mixture is dumped into the mixing box for the next batch of con-

Engineering 12-5-14

The Anderson Sales Co.,
Unity Bldg., Springfield,
50 Ct + 12¢ postage
Belle

crete. The cause of "dusting," which this process is designed to overcome, is in the partial setting of the cement that occurs under ordinary conditions while the surface is drying sufficiently to be troweled. Some setting is sure to occur during this interval and the subsequent troweling breaks up the crystals formed in this way. In addition to this, the troweling has a tendency to bring the excess water to the surface, forming a film of "drowned" cement. This scales off under wear and exposes a sandy finish that is subject to excessive abrasion. The new process, by extracting the water quickly, gives no time for the partial setting, so that no injury is done to the surface by the troweling.

ICE BOAT DRIVEN BY AN AERIAL PROPELLER

9134m

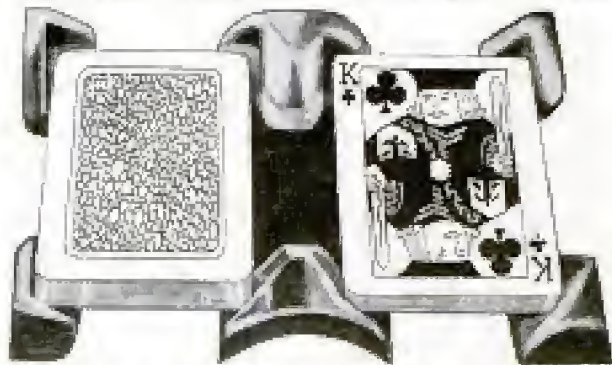
A motor ice boat driven by an aerial propeller and capable of making a speed of 50 miles an hour on smooth ice has been built and is in service in the East. This boat is 22 ft. long and 8 ft. wide, and carries eight passengers in addition to the pilot and engineer. The power plant consists of a 45-hp. motor which drives the aerial propeller, 8 ft. 8 in. in diameter. Each of the front runners is 44 in. long, while the rear runners are each 54 in. long. Both the front and rear runners are spaced 9 ft. apart. The front runners are connected to the body of the craft by vertical pins and are steered with an ordinary steering wheel.



CARD HOLDER FOR PLAYING THE GAME OF "RUM"

9170m

A board to be used in playing the popular card game known as "rum" has just been placed on the market.



This Board, Used in Playing "Rum," Keeps the Cards from being Scattered about the Table and Prevents Any but the Top Card in the Discard from being Seen by the Players

This board is virtually a metallic tray divided into two compartments, one for the pack and the other for the discard. Each compartment is open at the ends and sides, the cards being held in place by the upstanding corners. The purpose of the board is to keep the cards from being scattered about the table as well as to prevent any but the top card in the discard from being seen by the players.

This Ice Touring Car, Driven by an Aerial Propeller, Is Capable of Making a Speed of 50 Miles an Hour

Paul Thompson
10 Spruce St., N.Y. City

Monroe with 2. 7/16 at 11.00
postpaid 50¢
A.C. Inc. Albany, N.Y. 35¢

Underwood & U. 417 Fifth Ave. N.Y. City

9067
m

RUINS OF BURNED CHURCH INCASED IN ICE



This Curious and Beautiful Ice Formation Was the Result of Turning the Hose on a Burning Montreal Church, Which was Destroyed by Fire on Christmas Day, 1914, with the Thermometer Registering 18 Degrees below Zero

TALKING ACROSS CONTINENT

9231 *H* FOR FIRST TIME

On Jan. 25, 1915, telephonic communication was held between New York and San Francisco. This was the first time that the human voice had ever been transmitted across the continent, or in any other direction for such a great distance.

The circuit when put up extended from New York to Washington, D. C., Jekyll Island, Georgia, and California. From the capital, President Wilson spoke to President Moore of the Panama-Pacific Exposition, while the president of the American Telephone and Telegraph Company "listened in" from Jekyll Island. Before this, however, Dr. Alexander Graham Bell, inventor of the telephone, seated at a desk in Gotham, talked with Thomas A. Watson in San Francisco. These two men the first to speak across the continent, were also the first ever to use the telephone.

After a formal interchange of messages the original telephone instrument was cut in on the line. And even with this crude-looking apparatus it was possible to hear quite clearly from ocean to ocean. It is the same instrument through which Mr. Watson, then a young electrician working with Doctor Bell, heard the first spoken words ever transmitted over a wire. This was on March 10, 1876, in the basement of a building at 109 Court Street, Boston. Doctor Bell at the time was in his workshop on the top floor of the structure shouting with all his strength into the transmitter. The words were, "Mr. Watson, come here, I want you."

Some months ago construction parties working between San Francisco and Salt Lake City met at the Utah-Nevada state line, completing the first transcontinental telephone circuit, as described previously in this magazine. Had wires extended from coast to coast at the time Doctor Bell and Mr. Watson held their first telephonic conversation, however, it would have been impossible for them to have communicated across the continent, even

though it is possible today with the identical instrument they used 39 years ago. The reason is that the realization of the interoceanic system came not merely by the erection of wires, but as the result of numerous inventions relative to long-distance communication, one of the most important of which is the Pupin coil.

MEDALS GIVEN TO HEROES

9126 *m* OF VERA CRUZ

In recognition of their heroic conduct during the occupation of Vera Cruz, 14 sailors and marines of the United States Navy have each been presented with a medal granted under a special act of Congress. The presentation was made on Jan. 6, 1915, by the secretary of the navy, the ceremonies being held at the New York navy yard on the deck of the U. S. S. "Florida," on which all of the men receiving medals are stationed.



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GERMAN MILLS USE WIND AND

8937 *m* STEAM POWER

A curious combination of ancient and modern power is seen in some sections of Germany where many of the mills are equipped with windmills; much like those of Holland, as well as with modern engines using superheated steam, one serving as auxiliary to the other. One flour mill, which is typical, is driven by wind power whenever possible, but is provided with an 80-hp. engine which assists in furnishing the power when the wind power is lacking or insufficient.

From Athens

E. J. Edholm, 1353 West 36th Place
Los Angeles, Cal.

Canal Record 11/14/14

358

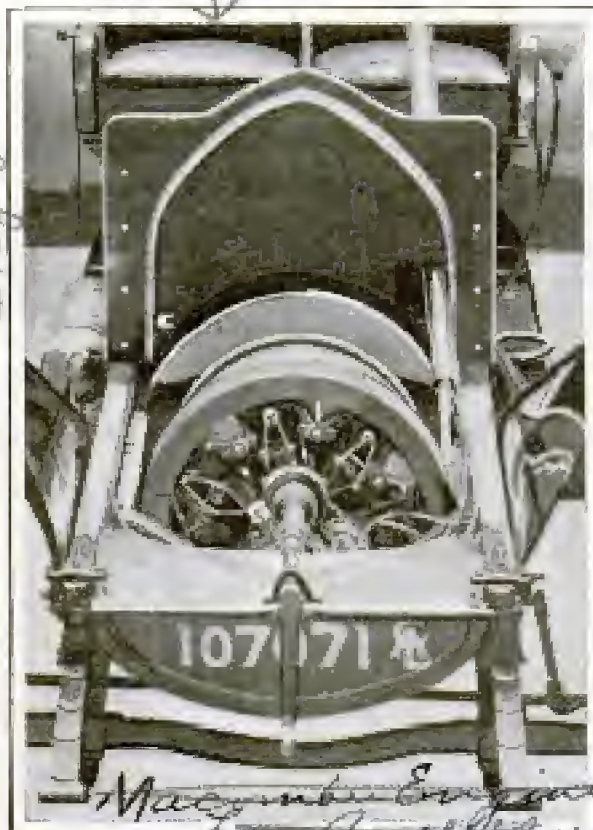
POPULAR MECHANICS

See Mch 1917-422 Same

NEW ROTARY ENGINE WITH HORIZONTAL CYLINDERS

A rotary internal-combustion engine recently brought out by a California inventor differs radically from any

"Macomber"



Front View of Rotary Internal-Combustion Engine
Having Cylinders Placed Parallel with the Shaft

hence made in that it has the rotating cylinders placed parallel with the shaft instead of parallel as is the practice with the engine and other rotary engines. In the new engine the horizontal motion of the pistons is transformed into a rotary motion by the action of the piston rods against a circular plate, or spider, which is held in an inclined position. In this way the centrifugal force, which is sometimes the cause of bad accidents, is greatly reduced. The engine acts as its own flywheel, as practically the entire mechanism rotates. Lubrication is positive, being arranged to take advantage of the centrifugal force which carries the oil to every part of the engine needing lubrication. Two sizes of the engine have been built and tried out, one being a 50-hp. engine that has

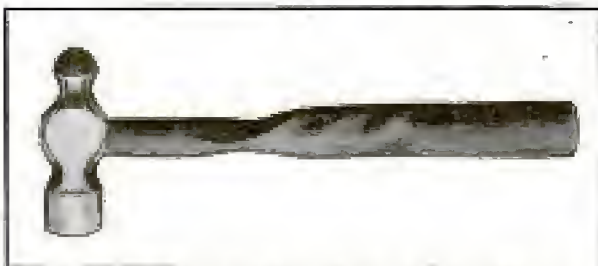
been used successfully for driving an aeroplane, and the other a 12-hp. engine particularly adapted to cyclecars. The 50-hp. engine weighs 250 lb. The simplicity of construction is indicated by the fact that the engine has only one cam, no valve push rods, and only two bearings for preserving alinement. Both engines are air-cooled.

HEAVY GRAIN SHIPMENTS THROUGH PANAMA CANAL

The largest item of cargo so far carried through the Panama Canal is grain shipped from the north Pacific ports of the United States and destined for Europe. In the 2½ months of canal operation, ended Nov. 1, 1914, the canal was used by 17 east-bound vessels engaged in this traffic, while eight west-bound vessels passed through in ballast to return later laden with grain. During this period an aggregate of 122,258 tons of grain was carried through. By having the canal available and thus being able to avoid the Magellan route, each of these vessels saved about 5,550 miles of distance and about 23 days of time in making the trip from the Pacific coast to English ports.

HANDLE WORN BY FRICTION OF HANDS

A hammer handle worn nearly in two by the friction of the hands during years of constant use is one of the curious relics preserved in a wagon maker's shop at Elkhart, Ind. This



This Handle was Worn Down by One Man's
Fingers in 25 Years

handle is of hickory and was used in an ordinary machinist's hammer for a period of more than 25 years.

L. A. Curtis, Elkhart, Ind.
used in Factory Studio -
baker wagon works,
the Record, Ind.

AN UNUSUAL KIND OF UNDERSEA PHOTOGRAPH



READERS of Popular Mechanics Magazine who recall the articles on making motion pictures under water, published several months ago, will be interested in this portrait of one of the young men who constructed the apparatus by means of which movies can be made at the bottom of the sea. This photograph of George Williamson was taken at a depth of 30 feet under water. His brother, Ernest Williamson, operated the camera from inside the glass-fronted steel chamber which, connected with the surface by a canvas and rubber tube large enough to admit a man's body, constitutes the submarine photograph gallery. The device was invented by the father of the Williamson boys, Captain Charles Williamson.

PROJECTILE MELTS STEEL BY THERMIT PROCESS

According to reports of tests to which it has been subjected, a projectile just invented by an American is one of the most deadly implements of war ever known. When this projectile strikes and explodes, molten metal at a temperature high enough to burn a hole through steel, or melt down solid concrete walls, is scattered broadcast. Curiously enough the metal with which the projectile is charged and the means used for making it molten comprise the application of a process that is in common use in the industries—that of thermit welding. The mixture known as thermit consists of fine grains or filings of aluminium mixed with a metallic oxide, usually that of iron or chromium. Aluminium has a high affinity for oxy-

gen. When this mixture is heated to a certain temperature the aluminium combines with the oxygen, the chemical reaction being so violent that the mixture instantly becomes molten and white hot with a temperature of something like 5,000° F. In the welding process the resulting aluminium oxide rises to the surface and is allowed to flow off as a slag, while the remaining metal binds together the parts to be welded. These parts are, of course, heated to a fusing temperature in the process.

The principle of the action that takes place within the projectile is easy to understand, although it has not been explained in detail. The projectile carries a high explosive that is detonated when the projectile strikes, though it can, of course, be exploded with a time fuse. Arranged around this explosive

Australasian Hardware & Machinery Oct. 1, 1914

Letter from Geo. A. Walton, Newbury Mass

is the thermit mixture. The heating of the thermit mixture is started as the projectile leaves the gun. Five seconds later the chemical reaction has taken place and the mixture is a mass of molten metal. When the projectile strikes and explodes, this molten metal is scattered in every direction, setting fire to everything within range that is capable of being burned. The projectile can be used in any of the modern siege guns. While it can doubtless be employed effectively against troops its principal use is expected to lie in the destruction of fortifications, buildings, observation balloons, and flying craft.

A SIMPLE DEVICE FOR GRADING COTTON

A simple cotton-grading device, especially designed for the convenience of farmers, is being introduced in the South. This is a pan-shaped recep-



Cotton-Grading Device in Which are Displayed the Nine Standard Grades of Cotton

tacle, about 18 in. in diameter and 2 in. deep, divided into nine equal compartments arranged radially around a central opening 6 in. in diameter. The entire front is covered with glass, but the central space is left open at the back. In each compartment is placed a sample of one of the nine standard grades of cotton. In grading, the farmer takes a fair sample of his cotton, holds it in the opening under the glass

and determines its grade by comparison with the standard grades in the receptacle.

HAT ACTS AS CONDUCTOR OF ELECTRIC CURRENT

That there may be danger for electrical workers even in the hats they wear was demonstrated in a fatal accident that happened in an electrical substation in northern Indiana. With hat in hand the foreman was explaining the details of some of the work in the new substation. The hat came in contact with the high-tension wiring, and the foreman received a fatal shock. The hat was an ordinary stiff hat having a band of steel reinforcing in the rim. The explanation of the accident is that the steel acted as a conductor, with the result that a circuit was completed through the hat and the foreman's body to the ground.

MACHINE MAY LESSEN USE OF POSTAGE STAMPS

The adoption of a stamping machine which it is proposed to lease to large users of the mails, and which, if put in service, would do much to lessen the use of adhesive stamps, thus effecting a material saving in the expenses of both the postal department and the large commercial houses of the country, is being considered by the government. The chief purpose of the machine is to expedite the handling of outgoing mail. In appearance it is not greatly unlike the ordinary canceling machines used in practically every post office of any size in the United States. The work accomplished by it is that of sealing, imprinting a prepaid stamp in lieu of the ordinary stamp, and counting and facing approximately 250 letters a minute. The important feature of the apparatus is its stamping, which is done by means of a cylinder that may be set to revolve a specific number of times, printing one label on each turn. The action of this cylinder is controlled by a meter which, when turned to a certain num-

The Farmers' Cotton Grader Co., 150 W. Jackson St., Dallas, Texas.

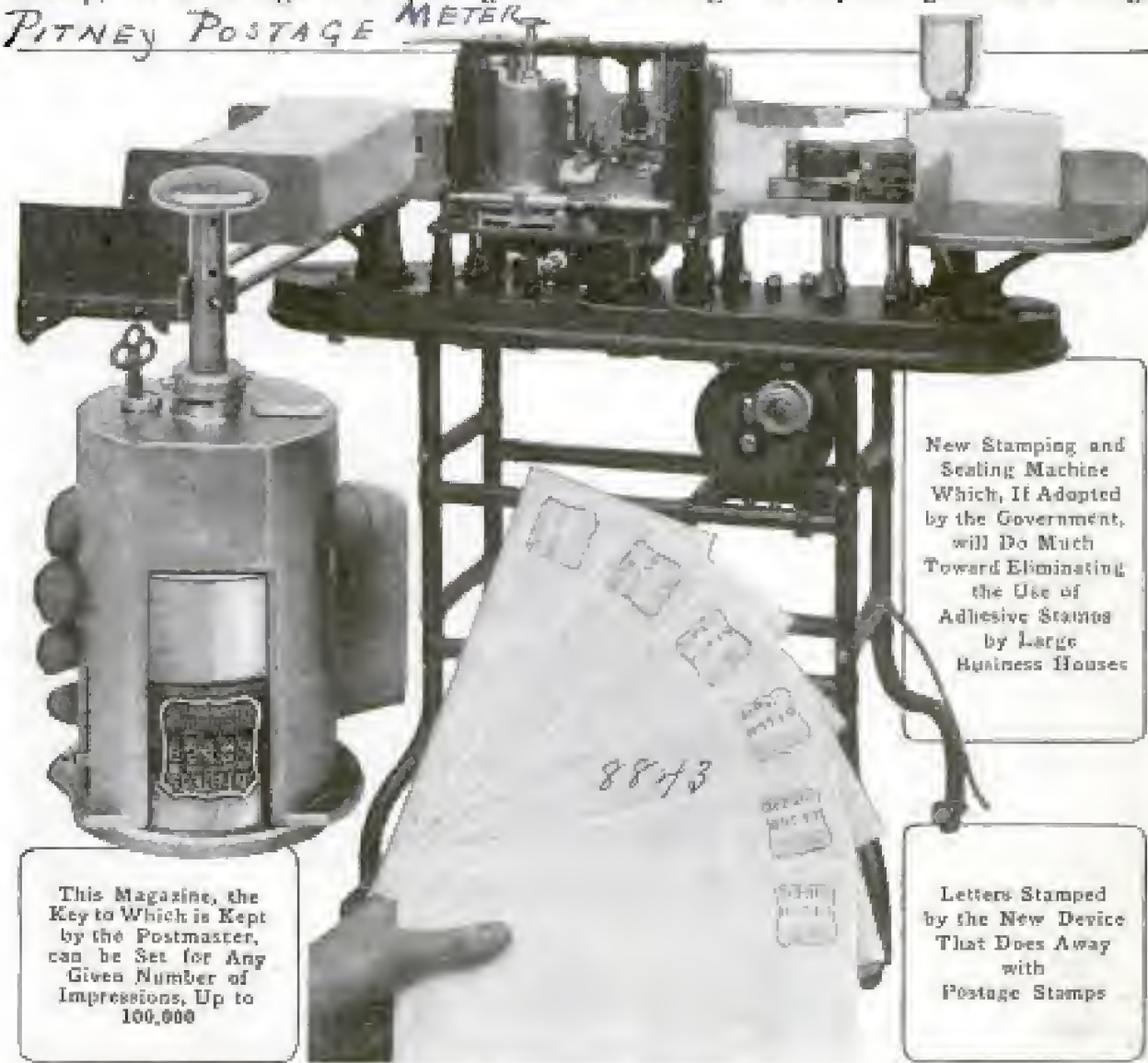
Tom Shiras
Mountain Home, Ark.

P. H. Ross, Room 1085, 440 S. Dearborn St. Chicago
American Postage Meter Co. 44-608 S. La Salle St.
16364639
POPULAR MECHANICS *Chicago, 361*
Ills.

ber, will automatically stop the machine when it has stamped that number of impressions, representing the amount of postage for which the user has paid. The impression, which appears in the same position as would a stamp, bears a figure indicating the

estimated that by the use of this machine the government would save a considerable amount of money annually in the cost of manufacturing stamps, including the cost of paper, printing, gumming, perforating, sorting, accounting, transporting, distributing,

PITNEY POSTAGE METER



This Magazine, the Key to Which is Kept by the Postmaster, can be Set for Any Given Number of Impressions, Up to 100,000

New Stamping and Sealing Machine Which, If Adopted by the Government, will Do Much Toward Eliminating the Use of Adhesive Stamps by Large Business Houses

Letters Stamped by the New Device That Does Away with Postage Stamps

amount of postage, a descending serial number which shows the number of impressions still due the user on his purchase, the name of the post office, and the license number.

A metal casing incloses the printing mechanism and register, and this must be taken to the post office before it can be reset. Each machine is fitted with interchangeable cylinders of this kind, carrying the various denominations of postage required for the different classes of mail sent out. It is esti-

and canceling. On the other hand, a saving in money and time would accrue to the individual users, it is asserted, since the machine facilitates the stamping, sealing, and counting of letters, and eliminates much manual work. Machines of a similar nature have been in use in New Zealand and Bavaria for several years. The principal saving of time at the post office in handling mail stamped in this manner would come in the elimination of cancellation.

FIELD TELEPHONE AND TELEGRAPH IN USE



German
Engineers in
Belgium
Repairing
Telegraph
Conduits



Germans Erecting
Telephone and
Telegraph Wires
through the
Argonne Forest



Field Telephone
of the Germans
Operated in
Connection with
an Observation
Post Maintained
in Top of Tree
in Background

IN VARIOUS CONTINENTAL BATTLE ARENAS



Isolated British
Soldier
Telephoning
Information to
His Headquarters



German
Restoring
Telegraph Poles
and Wires
Destroyed by
the Russian
Forces



Itinerant
Field
Telephone,
in Use by the
Germans,
While being
Moved from
Point to Point

TROOPS FROM AFAR FIGHTING IN EUROPE



Raw Recruits for
the Germanized
Turkish Army
Disembarking
from a
Steamer in
Constantinople
After the Holy
War was
Declared

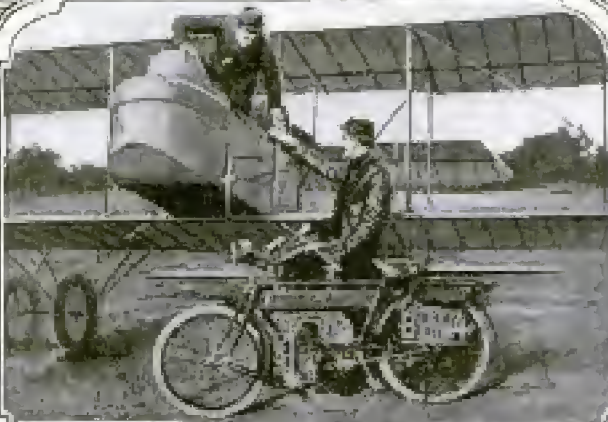


Fiji Islanders,
Who might be
Termed
Christianized
Cannibals, are
to Fight with the
Allies in Europe.
This Group is
under the
Command of
a British Officer



Australian Forces, Encamped in the Shadow of the
Pyramids, Who have Joined the Indian and Native Troops
to Defend Egypt against the Ottomans, Who are Attempting
to Wrest the Land of the Pharaohs from British Dominion

MAKING MILITARY OBSERVATIONS UNDER FIRE



Belgian Reconnaissance Airman Handing a Dispatch to a Motorcycle Messenger after Flight over Enemy



Lookouts on the French Line Watching the Movements of the Enemy through a Periscope



Behind Russian Lines during One of the Prolonged Engagements in Galicia: The Officers Observing Effect of Fire on Enemy



Members of the French Signal Corps Ascending in a Captive Balloon above the Battle Field at Arras

CURIOUS GLIMPSES CAUGHT OF EUROPE'S WAR



French Sharpshooters in Action during the Battle of the Yser. Pollarded Trees are Used by Military Observers of Both the Germans and Allies as Vantage Points and Places of Partial Concealment

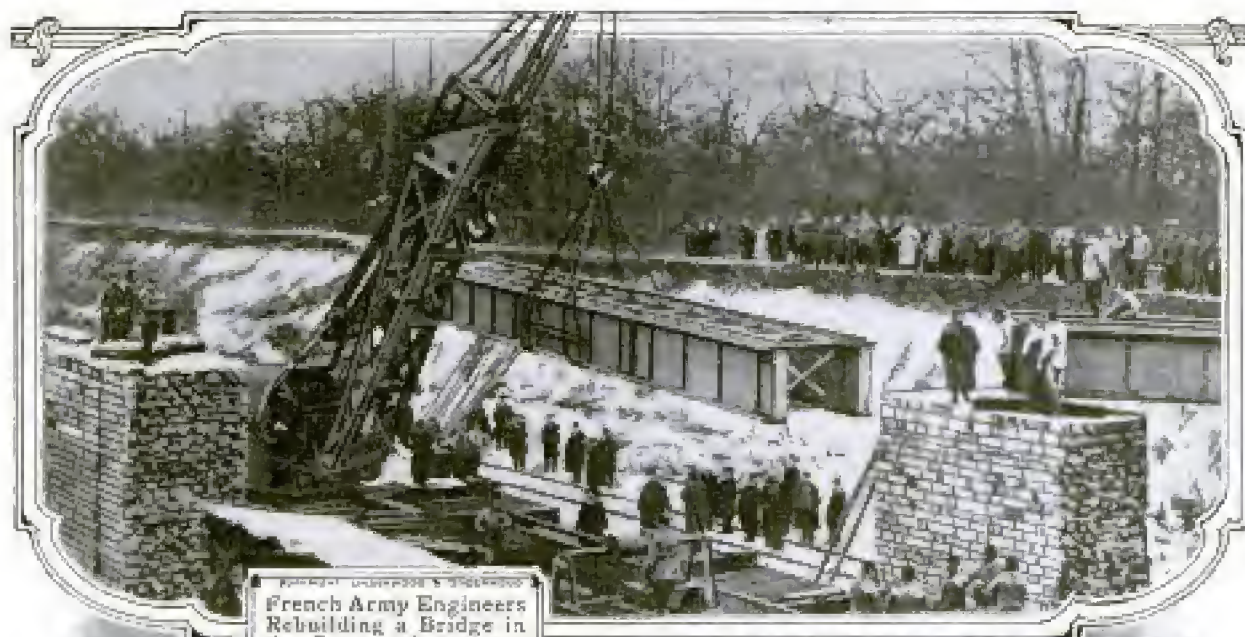


Entrance of a Subterranean Tunnel, Leading from the French Lines to Within a Few Feet of the German Trenches



Members of an Austrian Alpine Regiment on Skis Ready for a Dash across the Mountains. Some Carry Parts of Machine Guns on Their Backs

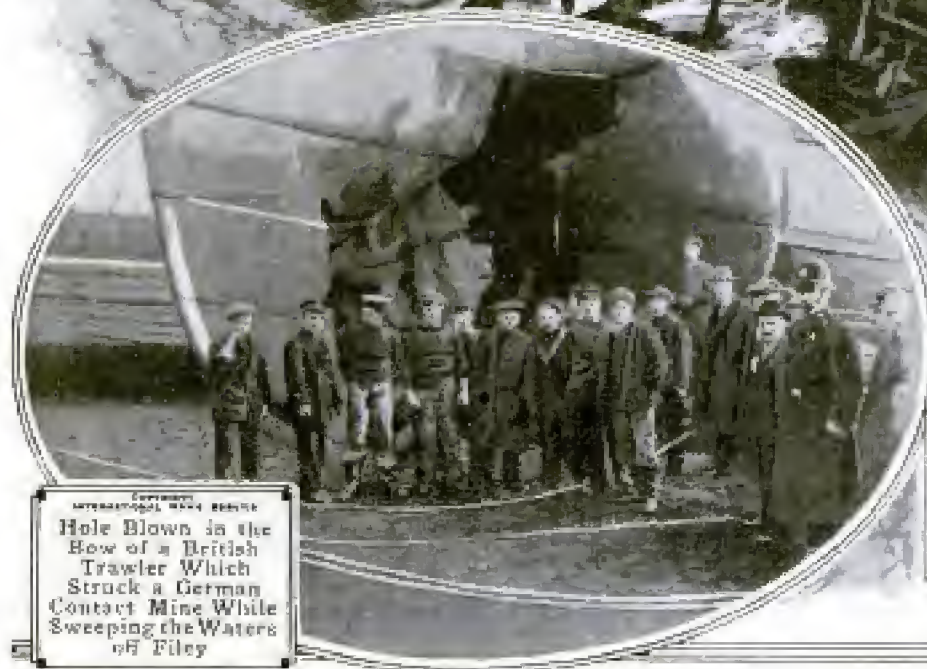
WRECKAGE ALONG EUROPEAN BATTLE PATHS



French Army Engineers Rebuilding a Bridge in the Forest of Argonne Which was Destroyed by Retreating German Forces in Order to Cut Off Their Pursuers



A German Train Loaded with Soldiers Crashed into the Rear of a Freight Train near Stendal, Telescoping Its Cars and Killing Many



Hole Blown in the Bow of a British Trawler Which Struck a German Contact Mine While Sweeping the Waters off Flin

HARDSHIPS SUFFERED IN WINTER CAMPAIGNS



German Soldiers in "One-Man Trenches," Such as are Frequently Dug When an Army Is under Fire. Individual Holes are Dug Which Later may be Connected under Cover of Darkness



Servian Soldiers Quenching Their Thirst by Drinking River Water through Holes Cut in the Ice. When There is No Snow, Water is Often Difficult to Find



Soldiers have Suffered Intensely from Exposure. This Shows a Servian Sentry Frozen to Death at His Post, a Not Uncommon Thing during the Winter



BENEATH THE TRICOLOR IN THE WAR ARENA



French Forces
Lined behind a
High Concrete
Wall Waiting to
Surprise the
Germans as They
Pass along an
Unprotected
Road



Member of the
French Cyclist
Corps Firing
upon a German
Pursuing Him
in an Open Field
near Arras



The Bathing
Facilities of a
Detachment of
the French
Forces at
Soissons, One
Hundred Yards
from This Are
the Advanced
Trenches of the
German Troops



This Curious
Thatched Box
Affords a French
Sentry on the Road
to Ypres a Protec-
tion against the
Cold Winter Winds

REPRODUCED BY PERMISSION OF THE UNITED STATES GOVERNMENT

BEHIND FIRING LINES WITH THE BRITISH



AND FRENCH FIELD ARTILLERY BATTERIES



English Artillerymen, Protected under Bomb-Proof Gun Shelter, Wearing New Sheepskin Coats of British Army



PHOTO BY HENRI DUCLOUX
This Shows One of the New 4.75-Inch Guns of the French Artillery Trained on a German Position



Convalescent French and British Soldiers Playing with Toy Cannons



Instructing Soldiers in the Mechanism of a British Water-Cooled Machine Gun

FALL OF GERMAN STRONGHOLD IN FAR EAST



Wounded Japanese
Soldiers being
Transported to the Rear
from the Scene of Action
in a Chinese Cart.
The Improvised
Ambulance is Forging
the Pesha River



Copyright
International News Service
Network of Wire
Entanglements
Which Protected
the Approaches
to the German
Fortifications
at Tsingtau



Copyright, International News Service
Effect of a
Japanese Shell on One
of the Defense Guns
of the Iltis Port

UNDER STUBBORN FIRE OF NIPPONESE GUNS



CAPITULATED
INTERNATIONAL NEWS SERVICE
Iltis Fort
after the
Bombardment:
An Example
of the Inability
of Strong
Fortifications
to Withstand
Modern Guns



During Heavy Firing
in the Early
Fighting at Tsingtau
One of the Large
German Defense Guns
Exploded. This Shows
the Remains of It



Landing of the Japanese Forces
at Looshan Bay, Which is near
Tsingtau. The Photograph
Shows the Troops Loaded in
Open Boats and being Towed
Ashore from the Transports



Nipponese Soldiers Pouring into
Tsingtau on Hand Cars at the Opening
of Hostilities against Germany

SCARBOROUGH AFTER THE GERMAN NAVAL



OFFICIAL
L. J. BROWN & SONS
A Shell Striking This House Wrecked the Roof and Interior, but Did Little Damage to the Walls



OFFICIAL
L. J. BROWN & SONS
Water Front at Scarborough Which for Centuries has Been the Point of Attack against England by Her Enemies



OFFICIAL
L. J. BROWN & SONS
Half of the Population Was Still Asleep When Shells began Falling. This Shows the Wreck of a Hotel



OFFICIAL
L. J. BROWN & SONS
Tower of the Scarborough Light-house Which was Pierced by a Projectile during the Assault

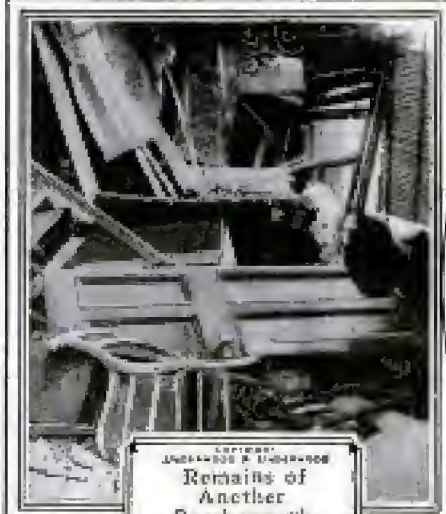


OFFICIAL
L. J. BROWN & SONS
In This House a Mother and Two Children were Killed

RAID ON UNFORTIFIED BRITISH COAST CITIES



CAPTION
LONDON & GLOBE
Several
Persons were
Killed and
Many Houses
Demolished
When Whitby
was Fired
Upon without
Warning



CAPTION
UNDERWOOD & UNDERWOOD
Remains of
Another
Scarborough
Home Which Was
a Target for
German Gunners



CAPTION
INTERNATIONAL NEWS SERVICE
This Life-Guard
Station Which is
Isolated from
Other Structures
Offers an Example
of German
Marksmanship



CAPTION
INTERNATIONAL NEWS SERVICE
Scarborough Castle
was Badly
Damaged. During
the Revolution,
When Fortified, It
was Also Shelled by
the American Navy

DANGERS WAITING IN THE PATH OF AN ARMY



REPORT—INTERNATIONAL NEWS SERVICE
Barbed-Wire Entanglements and Sharp-Pointed Spikes Planted by Belgian Forces near Dixmude to Impede the Advance of German Troops



REPORT—INTERNATIONAL NEWS SERVICE
Heavily Charged Mines Like This Guarded Approaches to Tellingau Forts



REPORT—INTERNATIONAL NEWS SERVICE
French Scout at Ypres Using a Pollarded Tree as a Protected Lookout While Watching the Movements of the Enemy through a Binocular



From This Observation Platform in a Tall Tree near Dixmude, Belgian Lookouts Were Able to Survey the Country for Several Miles in All Directions

CURIOUS GLIMPSES BEHIND BRITISH LINES



Group of Typical Indian Soldiers, Who are Fighting with the Allies in Belgium. Weighing Out Daily Rations for Their Forces Fighting in the Field near Ypres

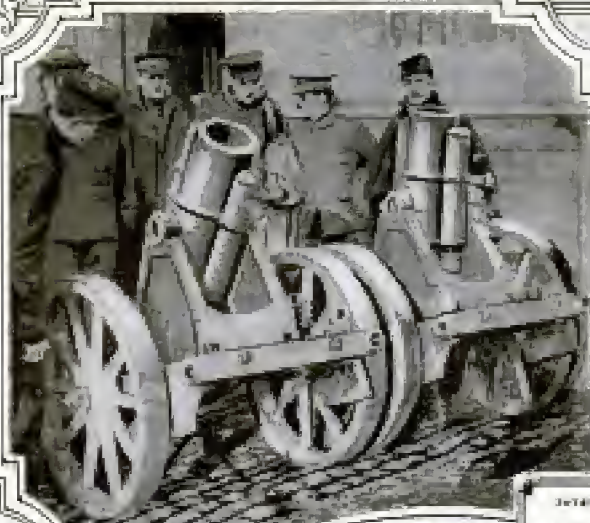


Bandoleers Carrying Ammunition, Strapped about Necks of Horses in One of the British Cavalry Regiments



Dogs Trained for Sentry Duty are being Used by the British Army. This Shows One of Them under Fire in a Trench

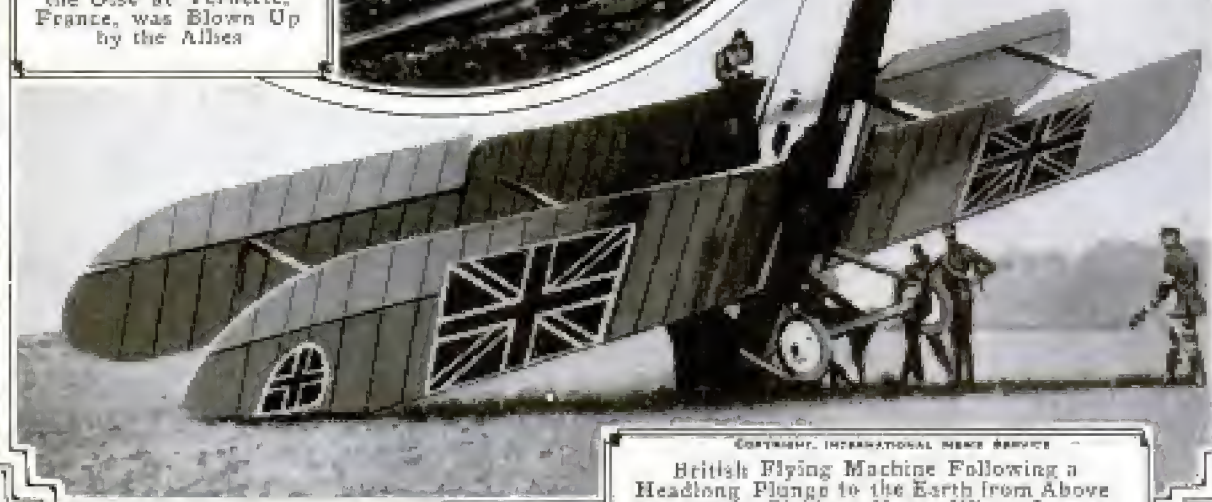
RUIN AND DEVASTATION MARK THE BATTLE



COPYRIGHT, INTERNATIONAL NEWS SERVICE
At Left: Two Mortars Abandoned by the Germans in Flanders and Subsequently Taken by the British



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To Retard the Advance of the German Forces a Railway Bridge across the Oise at Verherie, France, was Blown Up by the Allies



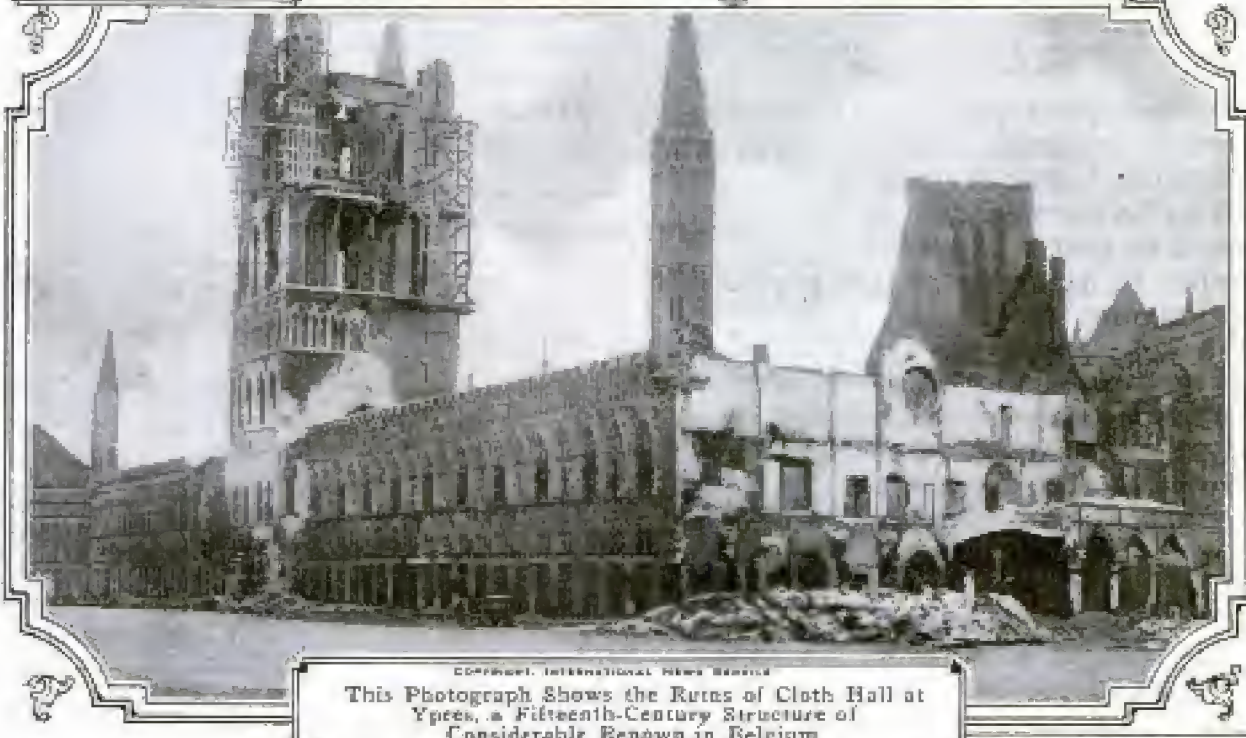
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British Flying Machine Following a Headlong Plunge to the Earth from Above the Battle Field at Ypres Where It was Engaged in Observation Work

PATHS CUT THROUGH WAR-HAUNTED EUROPE



Typical Group
of Prussian Refugees
Fleeing Westward
into the Interior of
Germany before
the Advancing Columns
of Russian Troops

Railway Station at
Albers, France, Which was
Damaged by Rifle and
Shrapnel Fire



This Photograph Shows the Ruins of Cloth Hall at Ypres, a Fifteenth-Century Structure of Considerable Renown in Belgium

H 8978
**NEW KIND OF FLAGPOLE
FOR LARGE BUILDINGS**

In order to simplify the main-
tenance of flagpoles which period-



When It Is Necessary to Paint or Repair This
Flagpole It may be Lowered onto
the Roof of the Building

ically require painting or repairing, a
tackle has been invented which, when
fitted to a pole, enables
it to be lowered onto a
roof so that it is acces-
sible to workmen and
eliminates the necessi-
ty of employing a
steeple jack. The appa-
ratus is designed to be
used with poles fas-
tened to stub members
on flat-roofed build-
ings. A shackle pro-
vided with a rope
sheave is placed around
the pole at a suitable
distance from the base,
while a second plate is
bolted to it near the top



of the stub, which also
carries a pulley. A
cable is put through
these three sheaves and
fastened to a drum, at-
tached to one side of
the stub, the gear of
which is engaged by a
worm shaft. When the
pole is in a vertical po-
sition it is bolted in
place so as to relieve
the cable from unnecessary strain. But
a moment's time is required to lower it.

H 8980
**SUGAR IS SHOWN VALUABLE
RATION FOR SOLDIER**

Sugar and chocolate, because of their
strength-giving properties, are being
supplied as a part of the daily rations
of soldiers fighting in the trenches in
various parts of Europe. It has been
found that a liberal allowance of sugar
greatly increases a soldier's ability to
resist fatigue and cold, while it also
gives him added strength for muscular
work. It is asserted that the best re-
sults are attained when the sugar is
dissolved in some liquid, such as tea or
coffee. When about 10 oz. of the prod-
uct is given a soldier regularly each
day it is claimed that he is far better
able to fight off the tendency toward
growing stale and breaking under the
nervous tension, than the man who has
been without sweets.

TYPICAL MEXICAN CEMETERY IN OPEN DESERT



Curious burial grounds, such as this one, are to be found in out-of-the-way
places, often many miles from a habitation, in the sparsely settled districts
of the Southwest. The mounds usually are simply marked with rough
wooden crosses or protected by picket fences.

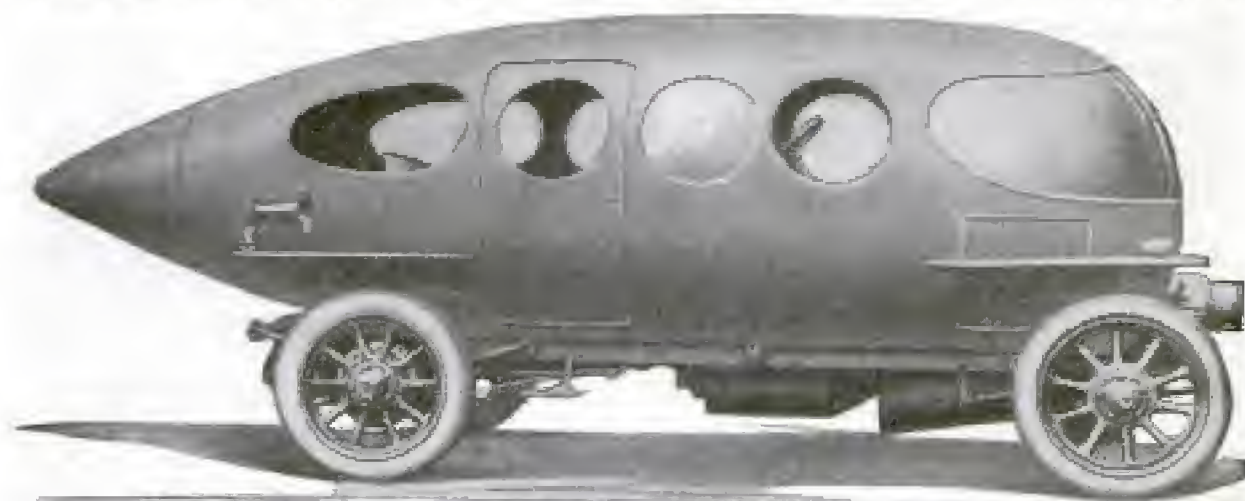
Ask Mr. Windsor

**#9056 CURIOUS MOTOR-CAR BODY
CUTS AIR RESISTANCE**

Designed for an Italian motor car in accordance with recent theories of aerodynamics, a torpedo-shaped body

**m8204 GASOLINE MOTOR CAR IN
RAILROAD SERVICE**

A gasoline motor car, having a capacity of 30,000 lb., has recently been placed in service for handling express



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The Torpedo Body on This Italian Motor Car Gives the Machine an Added Speed of 14 Miles an Hour

has been built which tests have shown overcomes a material amount of air resistance. The machine is equipped with a 50-hp. engine and when tried out with its chassis bare, was able to reach a maximum speed of 66 miles an hour. It is reported that when this curious-looking body was put in place and the car run over the same course with its gearing unchanged and its motor developing the same amount of power as on the previous test, it attained a speed of 80 miles. The subject of air resistance is one which is of material importance in designing all vehicles which are expected to develop high speed, since the resistance increases as the square of the velocity. Because of this, the experiments conducted with this new body have aroused considerable interest in Milan, as it gives the car a speed 14 miles an hour greater than it is able to attain without it.

New torpedo-boat destroyers to be built for the United States Navy will be equipped with four more torpedo tubes than are carried on destroyers now in service, as well as with two antiballoon guns.

and light freight on a railroad operating out of Minneapolis, Minn. This car is of a convertible type, being designed also for use as a passenger car during periods of heavy passenger business, and with this in view seats that are easily installed or removed are provided. It is of an unusual shape, having a pointed front end, from which the pilot is suspended, and a square rear end provided with steps for the ingress and egress of passengers. The power plant, located at the front end, consists of a 200-hp. gasoline engine. The car body is 45 ft. long, while the single traffic compartment has a clear length of 34 ft. Freight and express are handled through the side doors.



Gasoline Motor Car Built to Carry Freight and Express on a Minnesota Railroad



Cable-Laying Plow Which has been Found Both Economical and Time-saving in Work at Philadelphia

GEAR-SHIFTING INDICATOR

7938st FOR MOTOR CARS

To indicate the proper moment at which to reengage the gears in changing the speed of a motor car after

neutral has been attained, an instrument has been constructed which shows the peripheral speed of the secondary and clutch shafts. This informs a driver the instant the two are revolving at the same rate, allowing



COURTESY OF THE CAR

ing the meshing to be done smoothly and quietly. A speedometer is used to record the motion of the secondary shaft, while mounted over it is a transparent disk, marked according to the various possible speeds of the car, which is actuated by the clutch shaft. When the disk turns so that the number representing the speed about to be entered is even with the needle of the speedometer, the right time to shift has come. The device is easily applied to a car.

DITCH DIGGING ELIMINATED

8906st IN LAYING CABLES

Underground electric-light cables are being installed by a new method at Philadelphia, which, besides being economical and timesaving, goes far in lessening the damage done to parkings and lawns by trench digging in a city. The cable is attached to a torpedo-shaped pilot device fastened at the bottom of a deep, straight-bladed plow which is pulled by a gasoline engine mounted on a truck. The motor operates a winch, pulling the plow along by means of a steel rope, and thus draws the cable underground through the small bore cut for it. The share is mounted beneath a steel frame consisting of two parallel beams between which, at either end, is a heavy roller. The rear cylinder rolls the narrow strip of sod back in place as it is turned up by the neck of the plow. Not only is the expense of digging a ditch thus escaped, but also that of refilling, tamping, and resodding. Sixteen hundred feet of cable has been laid in this way in a single day. In doing this, 12 laborers were used, while several times that number would have been required by the old method.

Cotton-khaki suits are furnished British army recruits to be worn over civilian clothing while they are being drilled for service.

40 Royal Automobile Club
89-91 Pall Mall, S. W.
London

The Car, July 15, 1914
#634 #359

Clyde J. Applegate
1452 Thome Ave.
Chicago, Ill.

8554 H

LANDING BOAT PASSENGERS AT NOME, ALASKA

Because the nature of the coast at Nome, Alaska, is such that the construction of a steamship dock which would withstand the force of the heavy waves that frequently batter the shore line is a difficult problem, passengers arriving there are taken ashore on large barges. While this method is only a little less primitive than that used a number of years ago during the gold rush when rowboats were employed in the absence of barges, it is nevertheless the only means available. When the water is too rough for a

boat to discharge its passengers safely in this manner it usually remains far

Taking Passengers Ashore on a Barge at Nome, Alaska, from a Steamer Anchored Some Distance Out



enough off shore to avoid the danger of being beached.

9028 H NEW AERO-SLEIGH FOR USE AS AN OMNIBUS

An aero-sleigh capable of making a speed of 35 miles an hour on ordinary roads while carrying passengers, has been built by a mechanic at Lake Forest, Ill., who contemplates the establishment of a sled-bus line between that suburb and Chicago next winter. The experimental machine is 14 ft. in length and is fitted with two sets of runners which have a height of about 2 ft. It weighs approximately 300 lb., and is driven by a 60-hp. motor and aeroplane propeller mounted at the rear. The sled is steered the same as an automobile and has been tested on city streets where

it was subjected to the usual traffic regulations. It is said to be easily controlled and much better adapted for deep snow than an automobile. For general use the aero-sled will be fitted with a limousine body, which will give it the appearance of a motor car on runners, but not change its operating principle.



Experimental Aero-Sleigh Which has been Used on City Streets and Driven at a Speed of 35 Miles an Hour

Constructed by Harvey A. Beilgard, a garage proprietor of Lake Forest

*Edward C. Thompson, 1412 Federal St.,
N. S. Pittsburgh, Pa.
located on grounds of the Red Raven Co.,
POPULAR MECHANICS Red Raven, Pa.*



Ruins Built of Concrete in Imitation of a Doric Temple Form a Striking Feature of a Garden near Pittsburgh

SANITARY DELIVERY BUCKET 8369 *H* FOR ICE CREAM

Ice-cream containers made of heavy waterproof pasteboard are being introduced as a substitute for the wooden



buckets and metal cans customarily used for delivery purposes. One of the advantages claimed for the lighter carrier is that it eliminates the necessity, as well as the expense, of collecting and washing empty cans, and provides a sani-

tary receptacle for the frozen product. The cylinder in which the cream is contained fits within a bucket, which is made of the same material, and is packed in salt and ice. Air spaces beneath this holder prevent its contents from melting at the bottom more quickly than elsewhere because of warmth taken up from whatever it may rest upon. The waterproofing is sufficient to protect the product from contamination by salt water.

*The Weeks Carrier Co.,
385 Washington St., N.Y. City.*

CLASSICAL RUINS MADE OF 8699 *m* CONCRETE

The ruins of a Greek temple overlooking a miniature lake form a novel and striking feature of a garden installed by a manufacturing company near Pittsburgh as a breathing place for its employees. These ruins are artificial, being built of concrete in imitation of a Doric temple. The garden is located on one of the most important automobile routes in Pennsylvania and is visited by hundreds of motorists every summer.

Ship Salvage

SEARCH SEA FOR TREASURE 8391 *H* LOST HALF CENTURY

Two whaling vessels have been equipped at San Francisco for deep-sea salvage work and probably will spend the winter months in the South Pacific searching for a treasure ship which has been beneath the waves for nearly a half century. The boats are owned by rival companies, both of which are sending out expeditions in the hope of recovering what is reputed to be a \$12,000,000 cargo that was lost in 1866 when the steamer "General Grant" foundered on a coral reef somewhere in southern waters.

*Arch Macdonald
280 Lee St., Oakland, Cal.*

RAILROAD BREAKS RECORD 8756 IN HANDLING TROOPS

A railroad feat that is probably without parallel in the whole history of railroading was accomplished in the transportation of England's first expeditionary force to tidewater at the outbreak of the war, according to a report that has just been given out. Four days after the war began, the government requisitioned 350 trains of 30 cars each to be ready within 60 hours, but the railroads met the situation so promptly that the trains were all ready within 48 hours. During the departure of the expeditionary force, 73 trains were handled daily for a period of three weeks within the space of 14 hours a day. Almost without exception the trains came in on time, and landed the troops with their ammunition, guns and horses at the boat's side without a hitch.



How a Wounded Miner is Scrapped to the Carrier for Removal from the Mine to the Hospital

FIRE DRILLS REPLACED BY 8735 MINE-RESCUE DRILLS

Throughout the state of Washington mine-rescue drills are fast taking the place of the village fire drill, and a state-wide contest was recently held in Seattle between teams of mine rescuers that was much like the old contests held at the county fairs between village firemen. It is expected that this contest will be made an annual affair. The events in these contests are entered by teams consisting of six men, four of these being workers and the other two being the captain and the man who acts as victim. All five of the rescuers are equipped with oxy-

gen helmets to enable them to enter a burning mine or one which is full of gases. Under conditions as nearly like the real thing as possible, the team



Mine-Rescue Worker Equipped with Oxygen Helmet and Ready for Work, Shown Below

rescues the victim, gives him artificial respiration for a few minutes and dresses his imaginary wounds. One exhibition event was that of showing how a man can be pulled out of a chute after he has entered and been overcome by powder fumes from a

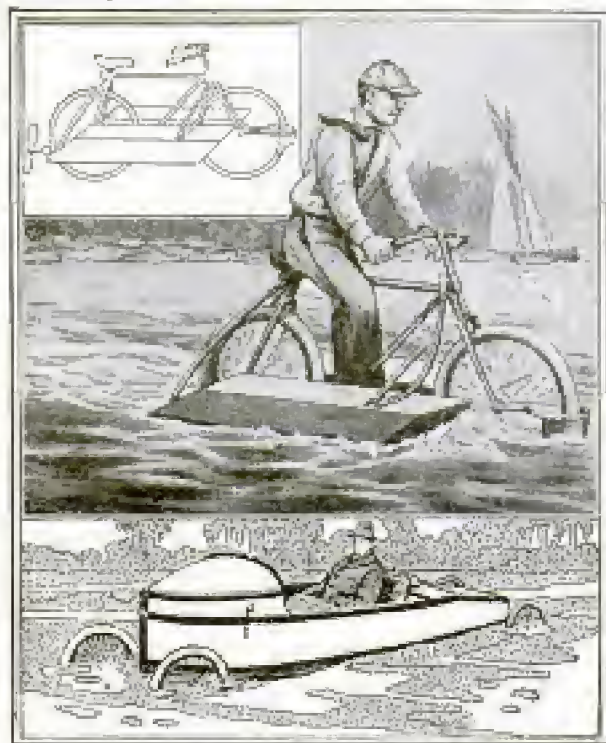
blast. The contest was held under the auspices of the U. S. Bureau of Mines, and in accordance with the methods employed by that organization.

John Oscar, 4109 Dorchester Ave., Chicago, Ill.

CURIOUS LAND AND WATER

8211 VEHICLES

An automobile that will run on water and a watercycle that will run on land are two curious recent inven-



Above: This Curious Machine is Supported on the Water by Hollow Wooden Floats That do Not Interfere with the Action of the Wheels on Land
Below: Automobile That Runs on the Water; the Rudder is at the Front and Turns with the Front Wheels; a Small Engine Drives Either the Propeller at the Rear or One of the Rear Wheels

tions. The automobile is a Scotch invention and is called a "hydro-car." The body and chassis are combined in one, the backbone of the machine being two longitudinal angle bars that carry all the weight. Upon these the engine, gear box, and seat are mounted, while the body is suspended fore and aft only. The body is made watertight, and has a pointed stem and a square stern. The power plant consists of a single-cylinder $4\frac{1}{2}$ -hp. engine. When the car is afloat this engine drives a propeller through bevel gearing, and on land it works on one of the rear wheels through a two-speed gear and chain. The rudder is at the bow and swings with the front wheels. The watercycle is an ordinary bicycle fitted with two hollow wooden floats, one fixed to each side

of the machine several inches above the ground and far enough from the frame to avoid interference with the pedals. On land and water the driving power is applied through the pedals, the two-blade propeller being driven through a chain by the rear wheel. The rudder consists of a piece of metal bent around the front wheel and supported on the fork so that it will swing with the wheel.

8374 TRAINING RECRUITS TO USE BAYONETS SKILLFULLY

One of the mechanical devices now being used in England to train recruits in the art of handling the bayonet is shown in the accompanying illustration. The apparatus has a wooden frame, approximately 10 ft. in height, with a horizontal beam at the base and top. Suspended in the center, between these two members, is a wire on which several thickly woven straw balls are threaded. These are so controlled mechanically that they may be dropped in rapid succession, slipping from the top to the bottom of the wire. As each ball falls it is the soldier's aim to pierce it with his bayonet, working quickly so as to stab each one in turn. This practice trains the infantryman to act quickly and accurately, and also develops his wrist muscles.



This Device is Used Particularly by the English Army in Training Its Recruits in the Skillful Use of the Bayonet

Jack Brooks, Howland,
Essex, England

BY RAIL THROUGH DARKEST AFRICA

Longest Link in the All-Steam Route from the Cape
8826 to Cairo will be Finished This Year

SOME time in the year 1915 the last spike will be driven in the 2,600-mile railway stretching from the Cape of Good Hope to the southern end of Lake Tanganyika in the heart of Africa, and with that act will be completed the longest link in the great Cape-to-Cairo Railway of which Cecil Rhodes dreamed and to the promotion of which he devoted the later years of his life. Rhodes dreamed of an all-rail route stretching the full length of the continent. In spite of his prestige and his record of success in big undertakings the project was laughed at as a wholly visionary scheme at the time it was first proposed. Now his dream is about to be realized.

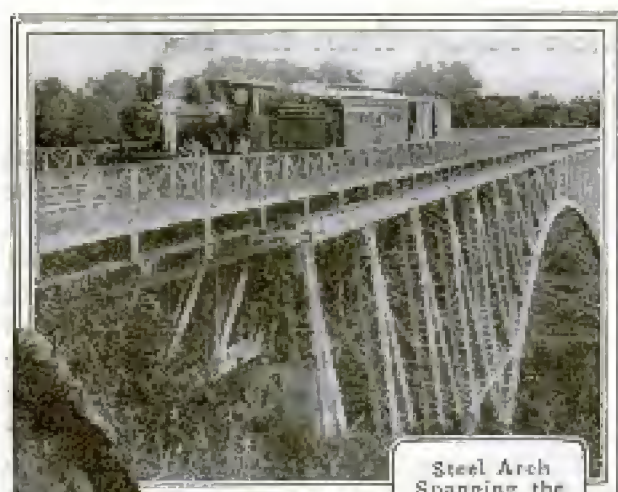
Out of a total of a little more than 6,000 miles required for connecting Cape Town with Cairo practically 4,000 miles will have been built with the completion of the railway construction now in progress south of Lake Tanganyika. Of the remaining links, five are navigable waterways on which lake or river steamers can be used. Three will require the construction of railways aggregating only 410 miles in length, and with the completion of these, there will be established an all-steam route consisting of a succession of railways and steamboat lines connecting Cape Town with Cairo. The construction of these lines can only be a matter of a year or two, while the full completion of the all-rail route will doubtless come in a short time, as time is measured in projects of such magnitude. When Cecil Rhodes died he left the most difficult parts of the line not only planned but financed.

Particular interest is given to this great undertaking at the present time by the European war. If the German arms are victorious the Cape-to-Cairo Railway, with the territory it serves, will be one of the richest prizes to fall to the victor. If Germany is defeated that country will doubtless lose its African possessions, which include Ger-

man East Africa, with the result that the construction of that portion of the all-rail route extending from the southern end of Lake Tanganyika to Uganda will be greatly simplified. The best location for the railway lies to the east of this lake, in German territory. An arrangement somewhat similar to that under which the United States holds the Panama Canal Zone has been made for a right of way through the Congo Free State, to the west of the lake, but if German East Africa should become British territory as a result of the war the eastern route will undoubtedly be chosen.

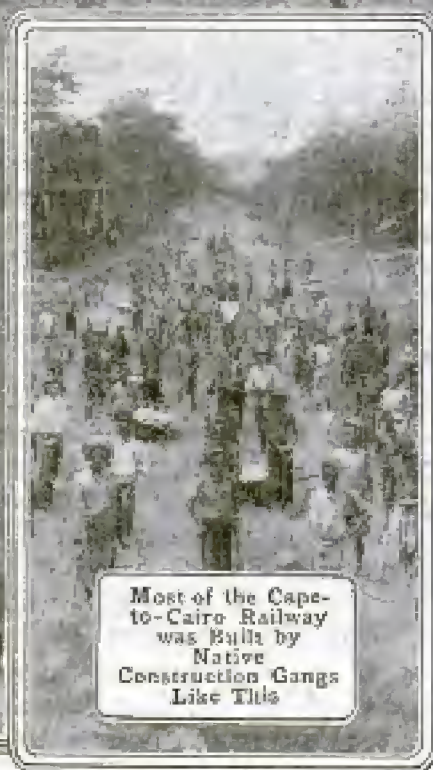
When finally completed the Cape-to-Cairo Railway will form a continuous route spanning the continent from north to south, but it will be made up of a number of separate railway systems, north and south trunk lines of each of these systems being used as parts of the through route. These individual systems are the railways of the Union of South Africa, the Rhodesian railways, the Sudan government railways, and the Egyptian state railways. Some of these trunk lines have been built for years, but each was so planned that it would not only serve local needs but would be suitable as a part of the Cape-to-Cairo route.

No railway line ever built is comparable to this in the varied interest of the regions which it traverses. Crossing the narrow coastal plain from Cape Town the railway climbs a succession of terraces to the central tableland of South Africa, and after crossing the Orange River it passes through Kimberley and the greatest diamond-mining district in the world, then through Vryburg and Mafeking to Palachwe, a town in Bechuanaland, near the Limpopo or Crocodile River. Much of this country is desert or semiarid and is subject to droughts and hot winds in summer and to extreme changes in temperature. After leaving Palachwe the line passes over the divide into the



Steel Arch
Spanning the
Gorge of the
Zambezi River
Just below
the Famous
Victoria Falls

basin of the Zambezi River, a basin that is nearly all well watered and is characterized by its tropical fertility. The Zambezi River is crossed near the famous Victoria Falls, which have almost three times the height of Niagara and twice the volume of water. The line then passes through the middle of the Zambezi basin to Kituta at the southern end of Lake Tanganyika. This is the end of the all-rail route and for the next 400 miles transportation will be by steamboat over the longest fresh-water lake in the world. Lake Tanganyika is 2,600 ft. above sea level and lies at the southern end of the great central rift valley that forms one of the most curious features of the African continent. This rift extends north into and beyond the headwaters of the Nile and was



Most of the Cape-
to-Cairo Railway
was Built by
Native
Construction Gangs
Like This

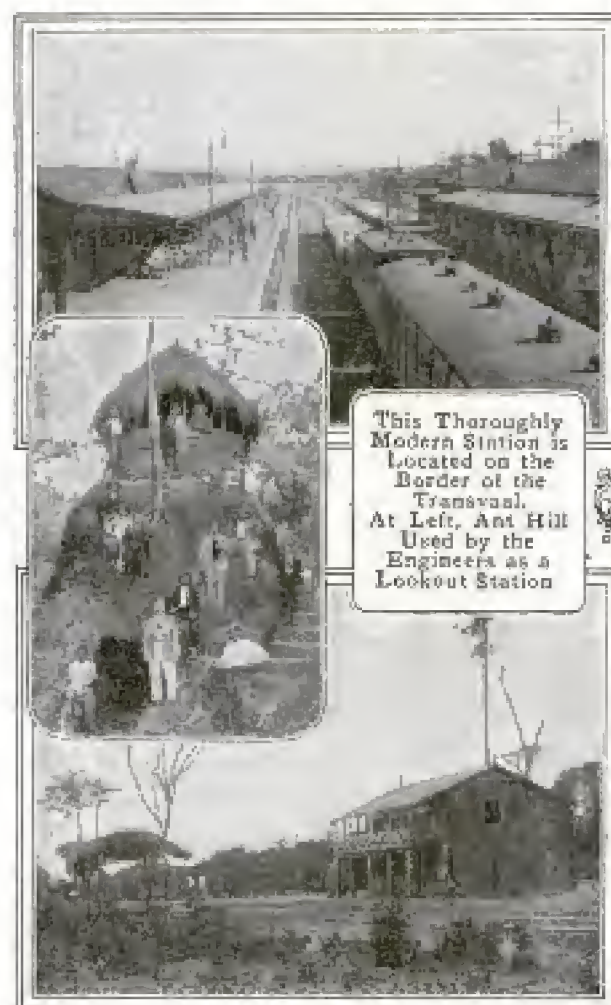


This Section
of the Railway over
Mitchell Pass Is
Typical of the
Heavy Work Required
in the Mountains
of Cape Colony

Motor
Inspection
Car Used
by the
Construction
Engineers

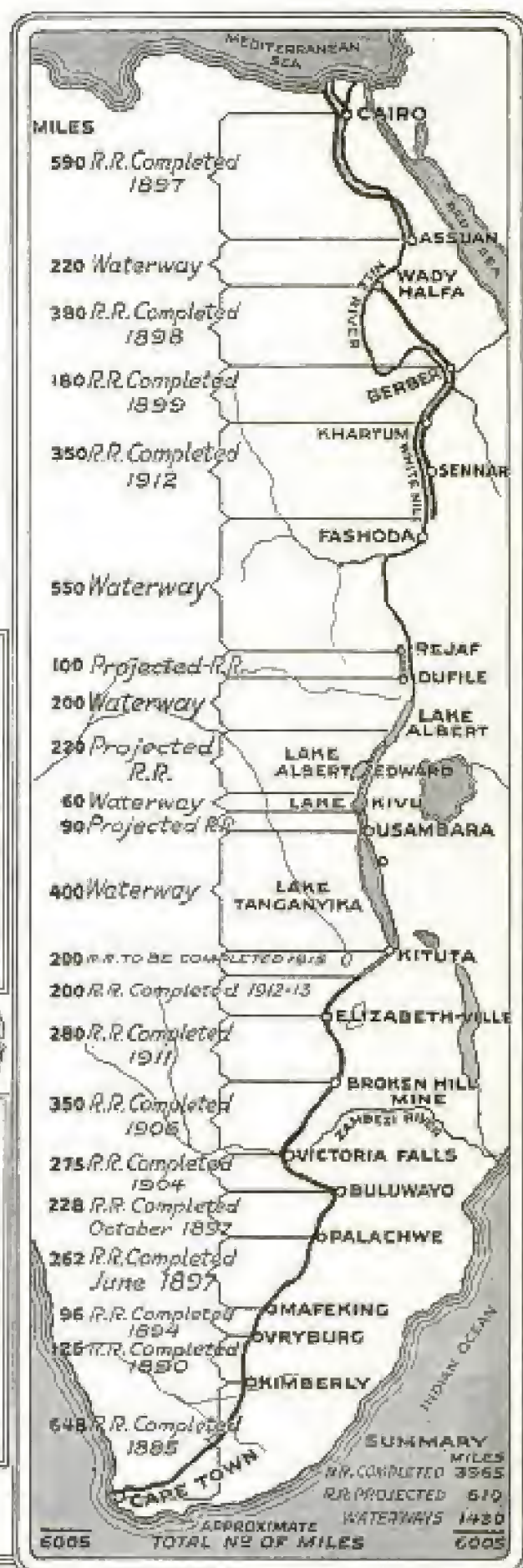
formed, according to geologists, by the sinking of an enormous section of the earth's crust. The line from Usambara at the north end of Lake Tanganyika to Rejaf, a town on the White Nile about 670 miles to the north, constitutes the undeveloped link in the all-steam route. Lake Kivu, Lake Albert Edward, and Lake Albert are all navigable, and will be used as waterways, leaving three short connecting railways to be built. At Lake Albert Edward, where there is always a heavy fog during the dry season and a remarkably clear atmosphere during the rainy season, the line reaches the headwaters of the Nile, which it follows to the Mediterranean.

By the time the traveler has reached Rejaf he has seen every fea-



This Thoroughly Modern Station is Located on the Border of the Transvaal. At Left, Ant Hill Used by the Engineers as a Lookout Station

Typical Jungle Station in the Congo Section
The Map Shows the General Location of the Railway, with Approximate Distances



ture of African veldt and desert and jungle, as well as the startling contrasts between modern civilization and the primitive and savage life of the surrounding desert or jungle, that is only to be found in Africa. At Rejaf the line enters the Sudan Desert, and from this point to the Mediterranean the route lies through the scenes of an ancient civilization. From this point the Nile is used for reaching Fashoda, about 550 miles distant, where connection is made with a railway extending to Wady Halfa and passing through Khartum, Berber, and Karnak, a village noted for its ancient ruins. From a commercial point of view this line is said to have been one of the most unpromising pieces of desert construction ever attempted. It was built by Lord Kitchener for the transportation of troops during the uprising of the Khalifa in 1896, and, contrary to all expectations, has proved a profitable investment ever since it was built. From Wady Halfa the Nile is again used for reaching Assuan, where the biggest dam in the world is located, while from Assuan there is a continuous line of railway following the Nile to Cairo.

Considering the magnitude of the project there have been few great engineering difficulties to overcome. While there are many important and interesting bridges the greatest engineering achievement is probably the steel arch bridge across the gorge of the Zambezi, just below Victoria Falls, which is one of the highest bridges of its type in the world. The greatest difficulty in the building of the line was in the character of the country itself. Clearing the line through the jungles and keeping it cleared was a difficult matter. Throughout the route it was necessary to maintain elaborate systems of food supplies, to use native police to preserve order among the native workers, and to organize staffs of physicians to look after sanitary conditions. In central Africa, hostile natives, deadly tropical fevers, smallpox, and sleeping sickness were a constant menace. It is reported that in one sec-

tion alone sleeping sickness caused the death of more than 4,000 natives. Attacks by wild animals were frequent, hundreds of laborers being carried off by lions, leopards, and other ferocious beasts, and by the crocodiles that inhabit the river swamps. Along the upper Nile the laborers were frequently driven from their work by herds of wild elephants, which even attacked several temporary villages along the line, destroying men, huts, and everything else that lay in their path. In one section monkeys would swing on the telegraph lines until the wires were broken down, and it was finally necessary to replace the wires with steel bars. In central and southern Africa the builders had the white ants to contend with. These ants live in colonies and build hills ranging from 20 to 30 ft. in height. They attack and devour the wood used in construction work, so that it was necessary to build all bridges of steel and to use this material for telegraph poles and, in some sections, for the cross ties.

In spite of the difficulties and the enormous cost of construction there is little doubt that the Cape-to-Cairo Railway will pay. It is a significant fact that not one of the main or branch lines built by the British in Africa has failed to prove a profitable investment. The interior of the continent is a vast storehouse of treasure containing thousands of square miles of forests, mineral lands, and rich agricultural lands that are still untouched and only need the intelligence and skill of the white man for their profitable development.

EXPLOSION OF FLOUR DUST WRECKS MILL BUILDING

A dust explosion which occurred in a Nebraska flour mill tore away one side of the structure. The photograph reproduced herewith shows in a striking manner what terrific force often accompanies a detonation of this kind. When the atmosphere in a mill becomes filled with flour dust, which is a carbohydrate, only a spark is needed to

W. G. Loebner

1400 East Talla St.,

Beatrice, Nebraska

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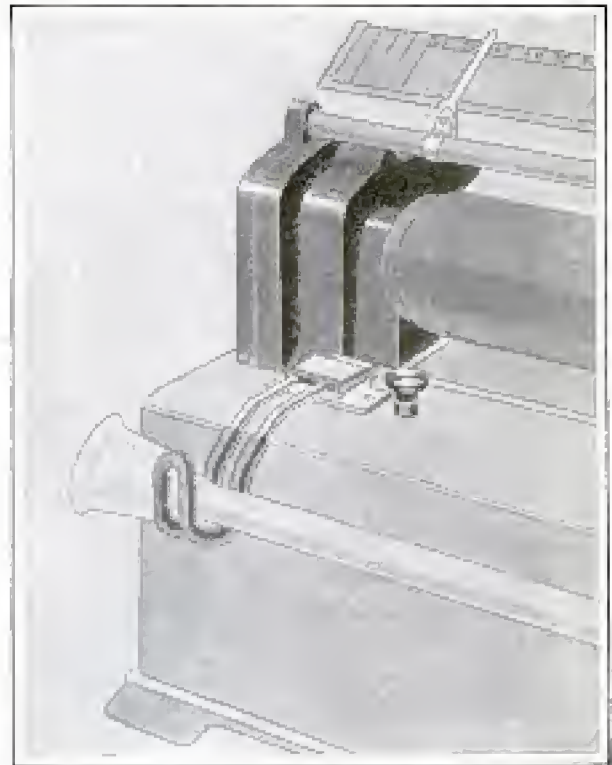
The Result of a Flour-Dust Explosion in a Nebraska Mill

make it unite with the oxygen of the air. The effect is the same as if the dust were gas. In this particular case the blast tore away a large part of one wall of the building, threw the others out of plumb, and hurled one of the employes of the mill from the third floor into the river.

MOVING PARTS ARE HOUSED ON DICTATING MACHINE

8379 One of the noticeable changes which have been made recently in the construction of a dictating machine is that all moving parts have been housed so that the user of the instrument is not distracted by its mechanical operation. The slow turning of the wax cylinder is the only movement now perceptible to the eye. A rest, upon which the speaking tube is laid when it is not in use, controls the operation of the motor. This consists of a lever which connects with the switch and breaks the current the moment it is pressed down. The opposite action takes place when the tube is lifted, the raising of the lever immediately start-

ing the machine, thus making it possible for a person to pick up the tube and commence dictating without giving further attention to the instrument.



The Moving Parts of This Dictating Machine have been Housed So That the User is Not Distracted by Their Action

Thomas A. Edison, Inc.
Orange, N.J.



The Proposed Peace Bridge Designed to Span the Niagara River and Join the Shores of Canada and the United States

PEACE BRIDGE IS PROPOSED TO SPAN NIAGARA RIVER

8534 To commemorate the centennial of peace between Great Britain and the United States and mark this period of friendship and prosperity with an enduring monument, it has been proposed that a bridge be built to span the Niagara River, immediately below the falls, joining this country and Canada. Preliminary plans for such a structure have been drawn by a member of an American committee which has the

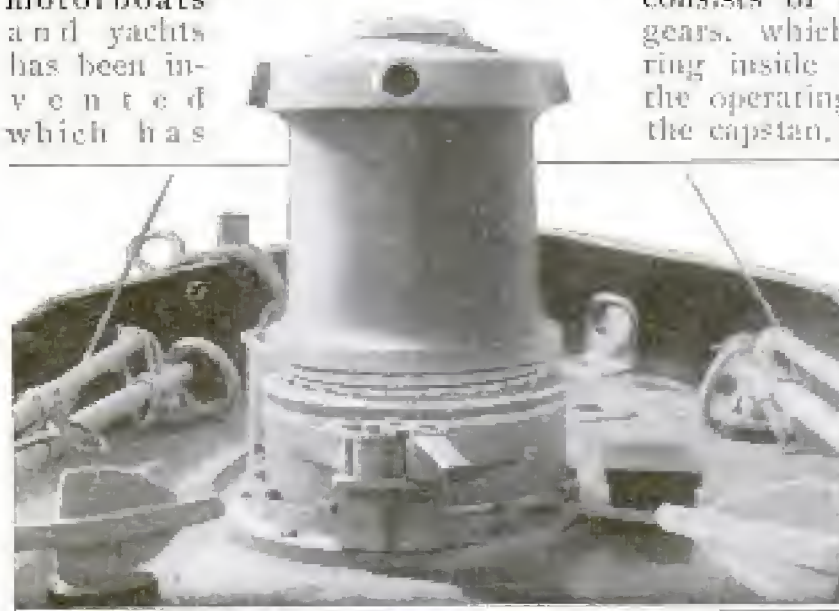
matter in charge, but the outbreak of the European war has temporarily interfered with any attempt which might have been made to execute the idea. If built as designed, the bridge would be a white, single-arch, reinforced-concrete structure, and the fifth bridge over the river below the falls. Two of the bridges now in use are of steel-arch construction, one steel cantilever, and the other suspension.

8841H ELECTRIC CAPSTAN WITH MOTOR INCLOSED

Embodying the qualities of lightness in weight, strength and compactness, an electrical capstan for use on motorboats and yachts has been invented which has

its various parts self-contained. The driving mechanism, which is inclosed in an oil and water-tight housing, consists of a motor with reduction gears, which travel on an angular ring inside the shell, built in. All the operating switches are placed on the capstan, the largest size of which

has a drawing power of about 2,500 lb. and a speed of 23 ft. a minute. By a brake arrangement the mechanism may be quickly disengaged and an anchor dropped. The use of light-weight alloys in both the foundation and shell serves to keep the weight down to 500 lb. It is suited for either rope or chain and may be turned either forward or backward.



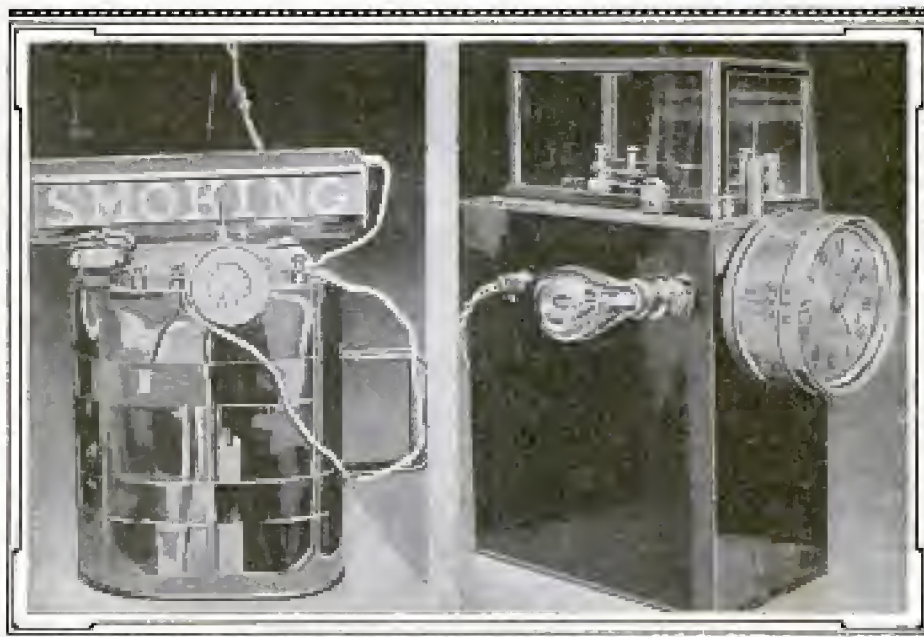
This Electric Capstan, Which Combines Lightness and Strength, Has Its Driving Mechanism Self-Contained

The Matthews Boat Co.,
Port Clinton, Ohio.

NEW METHOD OF SHIPPING

8716 EGGS

A new method of shipping eggs which, it is reported, results in a great reduction in the amount of breakage, consists in installing spring buffers on the inner sides of the end walls of the car, and in loading the egg cases on a rack which bears against these buffers and is supported on iron-pipe rollers extending across the car floor. The egg cases move as a unit with the rack, and the buffers absorb practically all shocks in the direction of the car's motion. When one test shipment was unloaded, all the cases were found to be in perfect condition with the exception of one which had evidently come in contact with some projection on the side of the car, and even in this case there were no broken eggs.



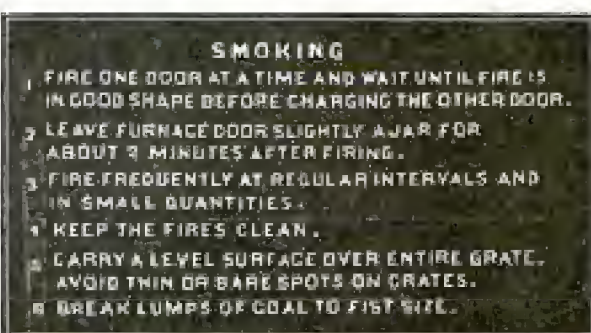
This Sign, "Smoking," is Illuminated When the Smoke from the Factory Stack Exceeds a Reasonable Minimum. Upper Right: Alarm Clock That Rings When the Chimney Smokes, and Records the Time

ELECTRIC SMOKE DETECTOR

8604 GIVES WARNING

Almost every city has its smoke inspector perched on the top of some skyscraper spying on the tall stacks that violate the law as to the proper behavior of chimneys. This man, at best, cannot observe many stacks, especially on calm and misty days. But a new electrical smoke inspector is on the job every minute of every day. Not only is the fireman notified when his furnace is wasting money by improper firing, but the superintendent is told as well. By the ringing of electric bells located in convenient places, and by the illumination of a

set of firing rules for the benefit of the fireman, the city's pure air is unsoiled, and at the same time money goes into the pockets of the owner of the stack.



SMOKING

- 1 FIRE ONE DOOR AT A TIME AND WAIT UNTIL FIRE IS IN GOOD SHAPE BEFORE CHARGING THE OTHER DOOR.
- 2 LEAVE FURNACE DOOR SLIGHTLY AJAR FOR ABOUT 2 MINUTES AFTER FIRING.
- 3 FIRE FREQUENTLY AT REGULAR INTERVALS AND IN SMALL QUANTITIES.
- 4 KEEP THE FIRES CLEAN.
- 5 CARRY A LEVEL SURFACE OVER ENTIRE GRATE. AVOID THIN OR BARE SPOTS ON GRATES.
- 6 BREAK LUMPS OF COAL TO FIST SIZE.

Rules for Stoking to Prevent Smoke are Provided for Fireman

The smoke-detecting instruments in use in a number of factories are especially interesting in that they make use of a somewhat new electrical application, known as "ionization" or the electrification of gases. The smoke monitor depends for its operation upon changes in the conductivity of the gases, due to the variable amount of smoke. The machine consists of an indicator, transformer, spark gaps, a condenser, bells, and signs. The sparks used in the indicators are essentially similar to those used in wireless telegraphy. The sign reads "Smoking." This is a cut-out-letter metal sign

R. H. Hamilton, 1619 E. Lincoln Ave.,
Cincinnati, Ohio.

(25 6/19/15) The Scientific Instrument and Electrical Machine Co.,
Mechanicsville, Penna.

covered with ground glass. Ordinarily the sign is not seen, but whenever smoke fumes, or dust, exceed a certain amount an electric light behind the sign is automatically turned on. Another arrangement is in connection with an ordinary alarm clock, which not only rings when the chimney is smoking, but by means of special recording apparatus makes note of the time when the smoking occurred.

COMBINED LAMP AND MIRROR FOR SHAVING

A novel development in portable electric lamps is one designed especially for the man who shaves himself. The lamp is mounted in a metal reflector, at the front of which is a circular mirror, held in place by clips and of such size as to leave a space of 1 in. around the edge between the mirror and the reflector. In shaving, the user simply faces the mirror and the light is diffused over the face through this open space. A hinged joint permits the adjustment of the lamp and mirror in any position. With the mirror removed, the lamp can be used as a reading lamp.

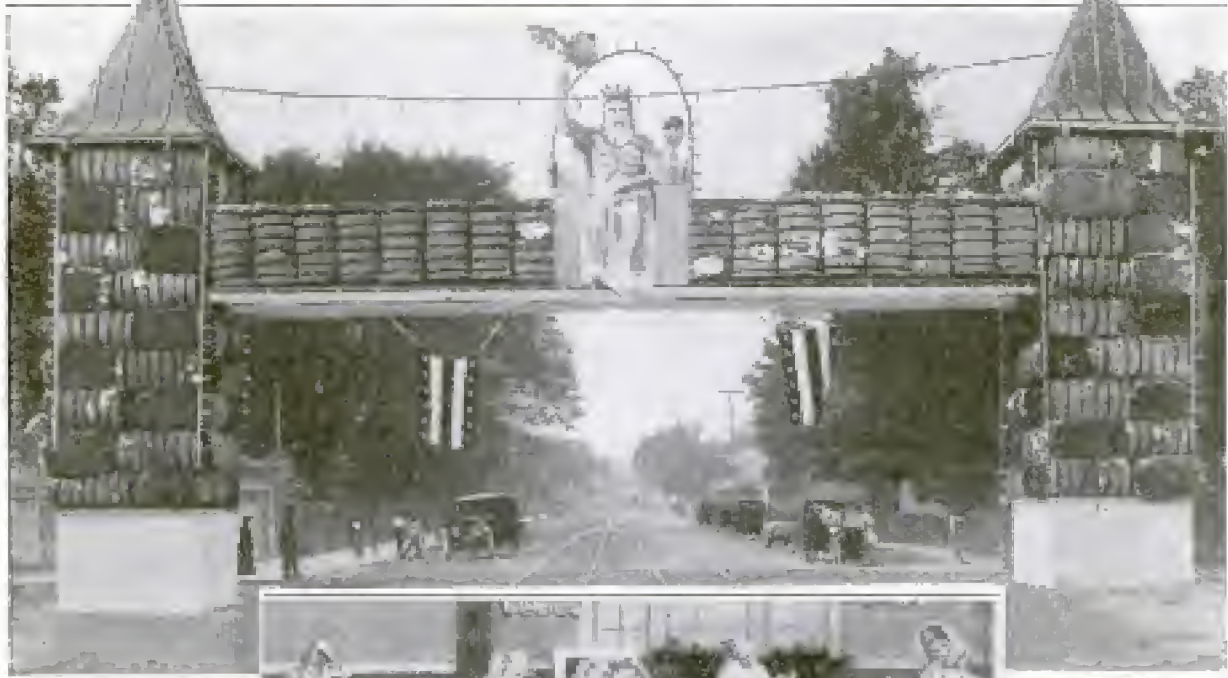


¶The British Admiralty has made arrangements to supply all of the officers and men of the navy with rubber swimming collars. These will be carried by each individual during the hours he is awake, and will be kept inflated and within easy reach during sleeping periods.

CUTTING PEARL BUTTONS FROM MUSSEL SHELLS

The first step in the process of manufacturing pearl buttons consists of soaking freshly dug mussel shells in large vats of water for a week or more in order to soften them for cutting. After being removed from these tanks and drained, the shells are sorted according to size by separating machines and then distributed to lathes where the button "blanks" are cut from them by revolving, saw-tooth-edged, cylindrical instruments. The blanks of a like diameter are sorted mechanically according to their thicknesses and then churned in barrel-like tumblers filled with water and pumice stone to smooth their edges. They are next placed in a grinding machine and passed on a belt beneath a carborundum wheel which cuts away the back, or rough side, of the shell, giving them all a uniform size. After they are again washed and put through a centrifugal drier, the blanks are fed into forming and drilling machines, in which they are cut to the shape desired and the holes drilled in them. At this stage, the buttons are in their final form, the only work remaining to be done on them being the cleaning, polishing, and ultimate sorting and packing. In finishing them they are placed in tumblers, partly filled with a sulphuric-acid solution, where they remain two hours before being transferred to a second receptacle, where they are kept for a corresponding length of time in a solution of hydrochloric acid. When the operation is completed, they are thoroughly washed and placed on wire-bottom trays which are set in a hot-air drying oven for several minutes. The buffing process consists merely of placing the buttons in rotary tumblers and allowing them to rub against each other for a half hour, after which they are run through a cylindrical sieve and dusted, and finally distributed to sorting tables where they are separated by hand, according to colors and conditions. After this they are packed in pasteboard boxes, or sewed to cards, as the case may be.

ARCHWAY AND STATUARY MADE OF
COTTON FOR EXHIBITION



This Arch, Made of Bales of Cotton, Formed the Entrance to the Exhibition Grounds at the Cotton Festival Recently Held at Waco, Texas



Numerous Figures Made of Cotton to Represent the Emblems and Trade-Marks of Different Local Business Houses were Exhibited

During a cotton festival held at Waco, Texas, scores of bales of cotton were utilized in the construction of a large arch which was built to span a street in front of the exhibition grounds and serve as the entrance to the place. In the middle of the structure appeared the figure of King Cotton, made entirely of the product. At

night it was brilliantly illuminated by electric lights.

Numerous pieces of statuary modeled from cotton, its hulls and seeds, were displayed at the exhibit. Many of these, which showed considerable ingenuity, served as advertising mediums for different local business houses.

AEROPLANE GIVEN ODD FORM
TO OBTAIN SAFETY

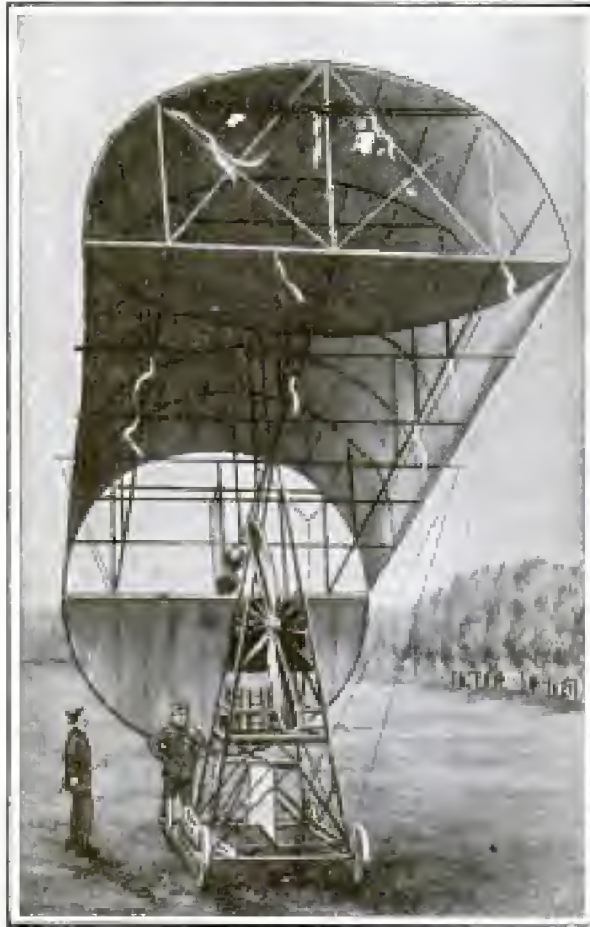
In one of the queerly constructed flying machines developed in France in the interest of safety in aerial navigation, the supporting surface has been given the form of a semicylindrical vault. This is twice as long as it is broad and is fitted with semicircular stabilizers at either end, which have

the effect of giving it somewhat the appearance of a dirigible. A device which is operated simultaneously from both sides of the craft permits a reduction of the sustaining surface, this being accomplished by reefing the covering fabric. Suspended from the center is a pyramid-shaped frame which carries the body, mounted at the front of which is a 14-cyl., 100-hp. motor of the rotary type. Cables arranged at

L'Aerophile + La Science et La Vie

Wm. H. Watson, Morton, Pa.
Designed by John F. Cozart, supt. Phila.
S.P.C.A. 36 S. 18th St., Phila.

the extremities of the longitudinal axis of the craft permit the angle of



Strange-Looking Monoplane Designed for Safe Flying

incidence to be controlled. The machine has a height of about 25 ft., a length of 15 ft., and a breadth of $7\frac{1}{2}$ ft.

ALUMINUM REPLACES COPPER FOR TRANSMISSION LINES

Because of its pronounced durability and its freedom from corrosion in districts where the air is permeated with salt, aluminum wire is becoming quite extensively used both in Great Britain and on the Continent in the construction of overhead transmission lines. Since improved methods of producing the metal have been developed, resulting in materially decreasing its cost, its use has been found more economical than that of copper in certain phases of the electrical industry. Several hundred miles of aluminum mains have been run in Europe. When used for

very small and heavily armored cables, however, the saving is not so great as it is with those of ordinary size. When they first commenced to be used, considerable difficulty was experienced in joining the lines, but although this trouble has not been completely overcome, it has been minimized to the point that it is no longer considered a serious drawback. When care is taken that all moisture is excluded, the joining may be affected with comparative ease. Several different mechanical clamps have also been developed which may be used for this purpose satisfactorily.

SANITARY DRINKING BAGS FOR HORSES

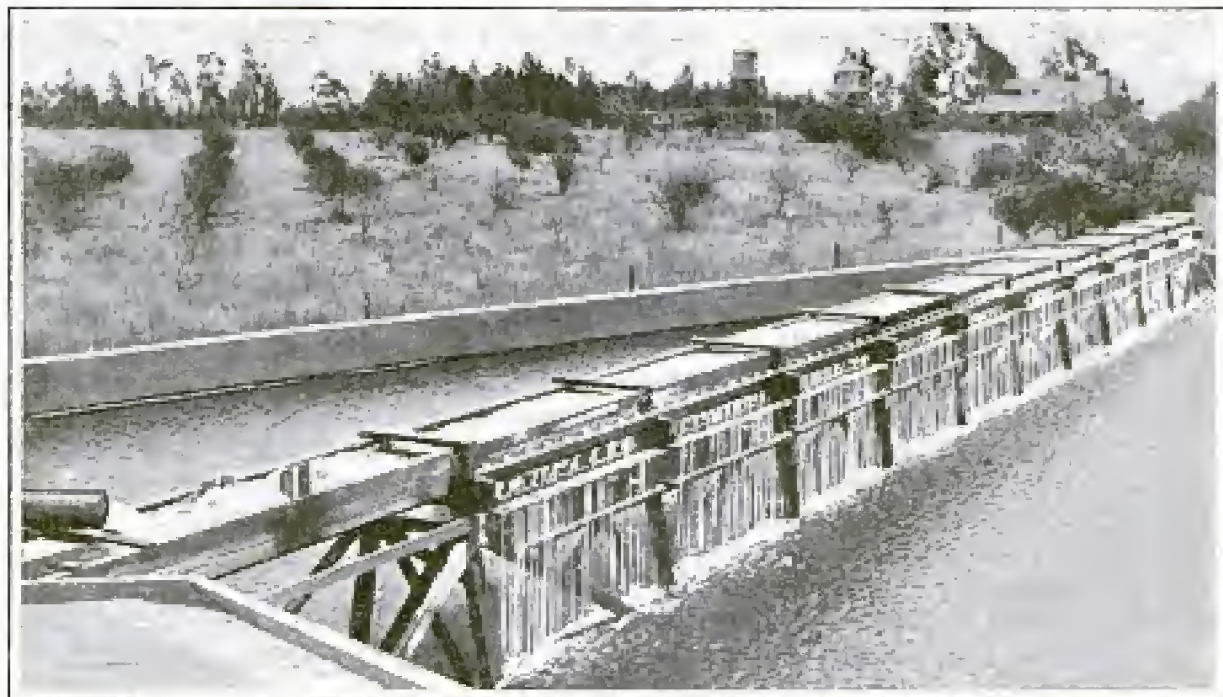
Individual water buckets for horses, constructed much the same as sanitary drinking cups, have been introduced at Philadelphia for the purpose of preventing the spread of glanders and similar diseases among stock watered at public fountains. The containers, which are made of paper and provided with reinforced bottoms so that they may be used several times, are arranged so that they may be folded and carried in a coat pocket by a driver. They are sold by an anticruelty society for slightly more than one cent each, and are believed to have done much toward keeping hundreds of horses free from infection.



Sanitary Water Buckets for Horses have been Used at Philadelphia to Prevent the Spread of Glanders

The Steamship

U. W. Killick, 1521 Oak St.,
Glendale, Cal.



Simple Plant for Aerating Sulphur-Tainted Water: The Water Trickles through Small Openings in the Trough to Corrugated Aprons, and from These into the Reservoir

TREATING SULPHUR-TAINTED 8003 WATER BY AERATION

A simple but effective aerating plant is used in treating the water obtained from deep wells at a town in southern California. The water, as it comes from the wells, is so strongly impregnated with sulphur that it is almost jet-black in color and has an offensive smell and taste. The plant consists of a shallow trough extending across the reservoir and kept uniformly filled by the supply pipe leading from the pumps. Through small openings spaced along the trough, the water trickles upon corrugated aprons and from the lowest of these into the reservoir, the idea being to subject the water to the action of the air for as long a period as possible in its travel from the trough to the surface of the water in the reservoir. This simple process is said to have proved entirely successful in eliminating the sulphur gas and making the water palatable for drinking.

☞ Kerosene may be used in winter for cooling motor-car engines, eliminating the danger of the radiator freezing.

CURTAINS ELIMINATE GLARE

8489 OF MOTOR-CAR LIGHTS

Transparent curtains for motor-car headlights which break up the blinding glare of powerful lamps for street use and unshade them instantly when they are needed for country driving, are being introduced. The shade is mounted on a roller which is contained in a small cylinder that may be attached above a lamp. A cord extends from the bottom of it to a foot button which is operated from the driver's seat. By pressing the plunger the curtain is either lowered in front of the lamp, or raised, as is desired. When the light is covered there is practically no glare and yet the illumination is strong enough for most ordinary purposes.



Eclipse Inf. Co., Auburn, N. Y.
Smith Bros., Auburn, Cal.
Sales Agts.

OCEAN-GOING LUMBER RAFTS OF THE PACIFIC

8987H Several times each year during the shipping season, ocean-going log rafts as large as some of the greatest inter-continental liners are towed down the Pacific coast from the lumber camps of Oregon into the harbors at San Francisco and San Diego. This is the way certain lumber interests of the Northwest are solving the problem of transportation of raw timber, for in contrast to a charge amounting to \$10 per thousand board feet, which was made a few years ago for shipment by rail, the cost by this medium is reduced to \$1. It does not only mean lower prices and an immense saving to the consumers, but it also enables low grades of material, which otherwise would represent a loss, to be placed on the market profitably.

In the last few years, 29 of these titanic log barges have been successfully floated to San Diego. In no case, so far as is known, has any serious trouble been experienced, and in most cases not even a log has been lost, despite the fact that the average length of these rafts is about 700 ft., the thickness approximately 30 ft., and the breadth amidships 55 ft. Between 4,000,000 and 5,000,000 board feet of timber is contained in each one.

Such a raft is made by poling timbers into a large floating cradle and then binding them securely into a cigar-shaped barge by means of heavy encircling chains. When about half of the logs have been arranged in this framework, the longest and most flexible ones being placed on the outside and all with their butts pointing amidships so that either end of the raft tapers properly, a 2½-in. steel chain is laid along the axis. Radiating diagonally from this center chain are placed several other chains which are joined with those placed to encircle the tapered ends, so that they are prevented from slipping, and the whole mass is given a certain rigidity. The rest of the raft is then built up with the assistance of a floating derrick

and bound together tightly by 1¾-in. chains placed at intervals of about 12 ft. The chains required in constructing one of these large rafts weigh more than 100 tons and cost approximately \$10,000. It is not necessary that the interior of the raft should be filled with uniform timber, or even with that suited for ordinary logging, and this makes it possible to include material which would be worthless, practically, if shipment by rail were the only available means of transportation.

WASHINGTON-ATLANTA ROAD TO BE OBJECT LESSON

8987H Under the supervision of government engineers a continuous series of model roads is to be constructed between Washington, D. C., and Atlanta, Ga., one purpose of the propaganda being to establish an "object-lesson" highway on a sufficiently large scale to attract public attention and assist in the movement for better roads. The plan which has been adopted for carrying out the venture places the expense of maintaining the roads, after their construction, upon the respective counties through which they pass. All teams, labor, and material are supplied locally and on this condition the government provides engineers to supervise the work. A similar arrangement is made in the improvement of post roads in different states. When an agreement is entered into, the state or county which is party to it bears two-thirds of the expense. The area of various roads constructed during 1914 under government supervision aggregated 691,535 square yards.

¶All motor trucks operating in New Jersey must be fitted with mirrors so that their drivers may view the road in the rear. The reason for this is that the position of the driver of the average truck is such that he is unable to see behind his vehicle.

*Information Sheet sent out
by Dept. of Agriculture*
Copyrighted material



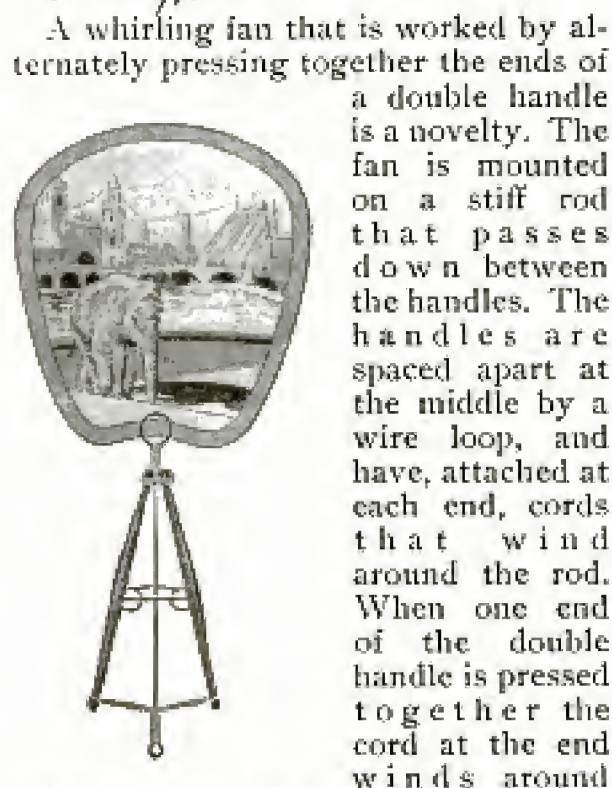
This Photograph Shows Three of the Ocean-Going Rafts, Any One of Them as Large as Most of the Transpacific Steamers, Anchored in the Harbor at San Diego After being Towed down the Coast from Oregon



One of the Great Rafts, Bound Together by More Than 100 Tons of Steel Chain, being Drawn into Port. Twenty-Nine Such Barges have been Piloted down the Coast in the Last Few Years

FAN WHIRLED BY SIMPLE

8562 *m* DEVICE

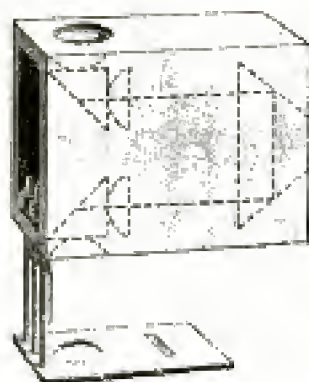


the rod, while that at the other end unwinds, giving the fan a whirling motion.

POCKET MICROSCOPE OF

8447 *m* HIGH POWER

A pocket microscope having a magnifying power of 30 diameters and a focal length of only 1 in. has been brought out in France. The distance that the light travels in this instrument in passing from the objective to the eye is 5 in., and this distance is provided for in the compact little case by reflecting prisms that are arranged on the same principle as the prisms in a modern binocular. The holder for the object is mounted on sliding bars and may be drawn inside the case by means of a thumb-screw, which also serves for focusing



the instrument. Magnifying powers up to 75 diameters are obtained in the same type and size of instrument by making one end slidable, so that the distance traveled by the light may be increased. This microscope is only $2\frac{1}{2}$ in. long, 2 in. wide, and $\frac{3}{8}$ in. thick.

NONEXPLOSIVE MOVIE FILM
8998 *m* PRODUCED IN FRANCE

What is stated to be a completely satisfactory, noninflammable motion-picture film has recently been produced by a French company, but on account of European conditions it is not available in sufficiently large quantities for general use in this country at present. Its basic composition is acetate of cellulose, which is not explosive, is difficult to ignite, and burns only when held in a flame. The principal constituent of ordinary films is nitrate of cellulose, which is highly explosive and readily bursts into flame when subjected to high degrees of heat.

About a year ago a nonexplosive film was introduced in the United States by the same company that has produced this latest one, but at that time there was an objection to the material used, the contention being that it quickly became brittle and cracked. Subsequent improvements with it are said to have entirely eliminated this. The new film has been in general use in Europe for some time. In appearance the noninflammable film is identical with ordinary ones, while for photographic purposes there is said to be no difference between them.

TRAP GUN FOR FUR-BEARING

8700 *m* ANIMALS

One of the latest aids for the trapper is a specially made trap gun which discharges unerringly at the head of an animal as the bait is pulled, but which is not dangerous to horses and cattle, as it cannot be discharged in any other way. The bait is placed on the end of a rod that projects in front of the gun muzzle. The gun is mounted on a swivel and is controlled by the rod so

La Nature 7/18/14

176 Boulevard St. Germain Paris Copyrighted material



New Trap Gun That Discharges Unerringly at the Head of an Animal as It Backs Off with the Bait

that it follows the motions of the rod from side to side or up and down, and always points a few inches above the bait. In setting, the steel stake on which the gun is mounted is thrust into the ground, the end of the rod is baited, and the gun is loaded and cocked. The gun does the rest when an animal tries to back off with the bait. As the gun invariably discharges at the head of the animal the fur is not injured.

AUTOMOBILE TIRE WITH STEEL SHOE

One of the latest developments in automobile equipment is a steel-shod pneumatic tire that is apparently proof against puncturing and skidding. The outer casing of this tire consists of approximately 100 hinged and interlocking sections of steel plates which extend over the tire from one side of the wheel rim to the other. Each section consists of 13 plates with hinges parallel to the rim, so that the casing is

perfectly resilient. Steel of seven different degrees of hardness is used in the manufacture of the casing, the tread being of extremely hard steel, and the side walls of softer and tougher metal. The weight of tire and casing is about double that of the ordinary nonskid tire.

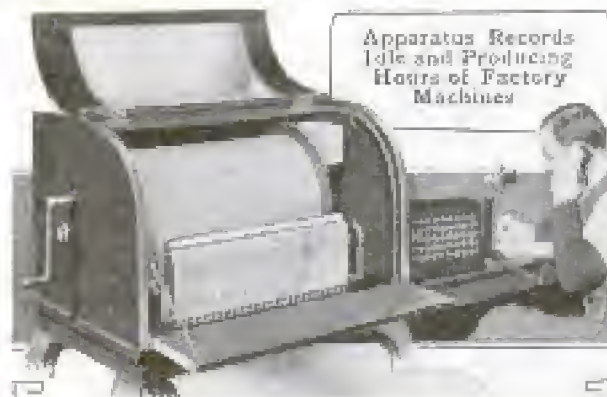


Steel Shoe in Place over Automobile Tire: Each Section is Composed of 13 Hinged Steel Plates

W. S. Wood, Auto Editor, Evening Herald, Los Angeles, Calif.
Inventor, A. H. Savage, manufacturer of Savage tires
Copyright 1911, U.S. Pat. 911,111

MACHINE SHOWS PRODUCTION EFFICIENCY OF FACTORY

A machine has been devised which automatically watches each producing unit in a manufacturing plant and re-



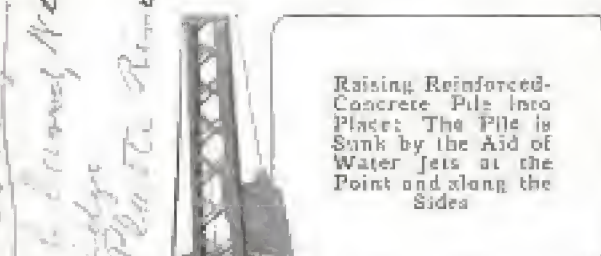
records its behavior. The apparatus, which is electrically controlled, is provided with a large drum on which a ruled chart, divided into hours and minutes, is mounted. This cylinder is revolved by a weight and controlled accurately by clockworks, while the record is made on the chart by means of styluses actuated by electromagnets, from which wires lead to the various machines under scrutiny. Electric con-

nections are made with these by especially designed switches. Adding devices are so arranged that all productive moments of a machine are footed minute by minute.

The recording machine is started at the moment work is supposed to commence for the day. As each machine in the plant is started up, the fact is indicated on the chart. If a lathe, for instance, is running idly, a staggered mark is drawn by the stylus in the chart column corresponding to its number, while, if it is producing, a straight mark is made. The instant the lathe is stopped, the marker moves to an idle position and the adding instrument stops its operation. When the man in control of the indicating apparatus sees that a machine has stopped during work hours, or that it is not producing when it should, he ascertains the cause and makes a record of it so that the loss of efficiency, which is ordinarily covered by vague reasons, is clearly explained in every instance.

SINKING CONCRETE PILES WITH WATER JETS

Reinforced-concrete piles molded ready for use and sunk to a firm bearing with the aid of water jets, issuing through holes in the concrete connecting with a central water tube, is the latest method for building foundations and bulkheads. With this method the pile is not hammered into place, a proceeding that is always liable to result



Frank E. Perkins,
Erie Co. Savings Bank Bldg.,
Buffalo, N. Y.

Edwards & Kellogg, Inc. Dept. C. B. & C. Co.,
Lincoln, Neb.
"Edwards & Kellogg" Piling
Dept. C. B. & C. Co.,
Lincoln, Neb.

in damage to the pile, but is simply churned up and down as the water jets play along the sides and under the point. The jets along the sides supply a water skin so that the pile is easily raised and lowered while the jet under the point softens the material and permits the pile to force itself downward at each impact. It is claimed that this method furnishes a means of sinking concrete piles without danger of damage through practically any kind of material except solid rock.

SOMETHING NOT OFTEN SEEN 8790 *in* ON THE LAWN

After dressing up in his "working" clothes, a professional contortionist allowed himself to be photographed in the front yard of a friend's house while going through some of his peculiar acts. One of the snapshots is reproduced herewith, and shows the performer as he appeared in the guise of a



This Is Not a Frog, but a Contortionist
Performing on a Lawn

gigantic frog, an apparition somewhat terrifying to the uninitiated passer-by.

PERSIAN FAT-TAILED SHEEP 8744 *if* INTRODUCED IN UTAH

The curious Persian fat-tailed sheep are now being introduced in this country, there being several herds, numbering about 2,000 in all, on the national forest lands of southern Utah. The tails of these sheep sometimes grow to a weight of 40 or 50 lb., and, like the hump of the camel, serve as a reserve

supply of nourishment when food is lacking. The sheep shown in the illustration does not have the tail devel-

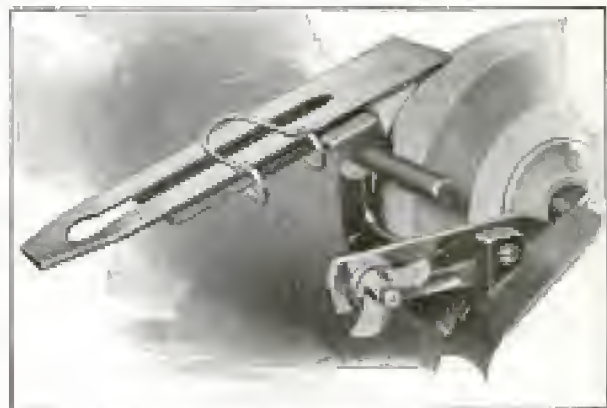


Specimen of Persian Fat-Tailed Sheep Now Reared
on a Utah Ranch

oped to such a degree as is common in Persia, where it is often necessary to lash a small cart to the tail to keep it from dragging on the ground.

CONVENIENT TOOL GUIDE FOR 8503 GRINDING WHEEL

For use with a grinding machine, a simple tool holder and guiding device, which has been introduced, consists of a steel plate that may be moved along a rod mounted parallel with the axis of a carborundum wheel. An instrument which it is wished to sharpen is secured to the guiding plate by means of a clamp, while it may be tilted to any desired angle by the exertion of slight pressure. There are no set-screws to be adjusted when the device is used.



Tool Holder and Guiding Device for
Grinding Machine

Bristow Adams
Forest Service, Wash. D.C.

mfr: The Carborundum Co.,
Niagara Falls, N.Y.
Copyrighted material
W. C. Sells. Adv. Dept.

DISAPPEARING PEACH TREES OF COLORADO ORCHARDS

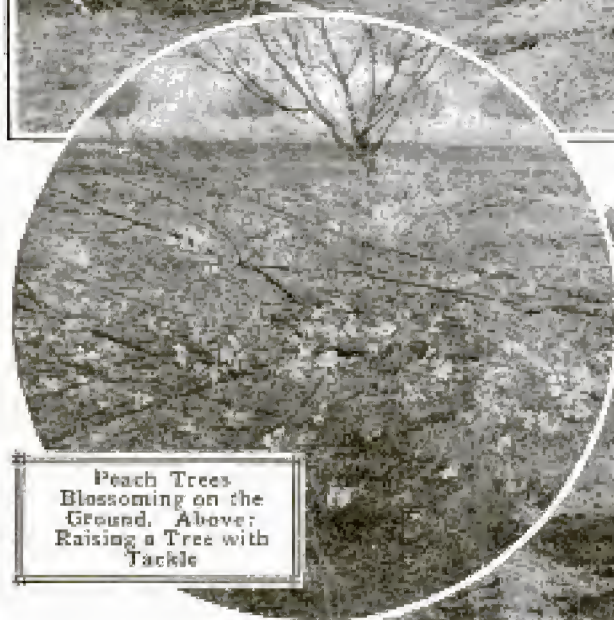
8787 H

Some of the Colorado fruit growers on the eastern slope of the Rocky Mountains have adopted an ingenious method for protecting their peach orchards during the winter season. The plan, which has been found to be a meritorious one, consists of bending the trees down to the ground, covering their branches with hay or straw and then burying them under about two inches of soil, in much the same way as blackberry and raspberry bushes are cared for in cold climates. Although in the past the peach trees in this section suffered much damage and frequently were killed outright during the winters, by this method of culture they

are surviving severe weather without difficulty and bearing good yields of fruit.

As soon as the trees of a new orchard begin to grow, they are given their preliminary preparation for the winter treatment. On two opposite sides of each tree the roots are cut away and braces substituted to keep them in an upright position during the summer. Just as quickly as the leaves fall in the autumn, the orchard is flooded with water and the earth around the roots of the trees thoroughly saturated. The dirt on one side of each trunk is then removed and the braces are taken down so that the trees fall to the earth,

their narrow strip of roots, however, remaining intact in the ground, since they are pliable enough to allow this operation without breaking. Each tree is then covered with hay and dirt and left undisturbed until some time in



Peach Trees
Blossoming on the
Ground. Above:
Raising a Tree with
Tackle



A Colorado Peach Orchard Where the Trees Are on Natural Hinges and are Turned Down and Covered to Prevent Them from Freezing in the Late Spring

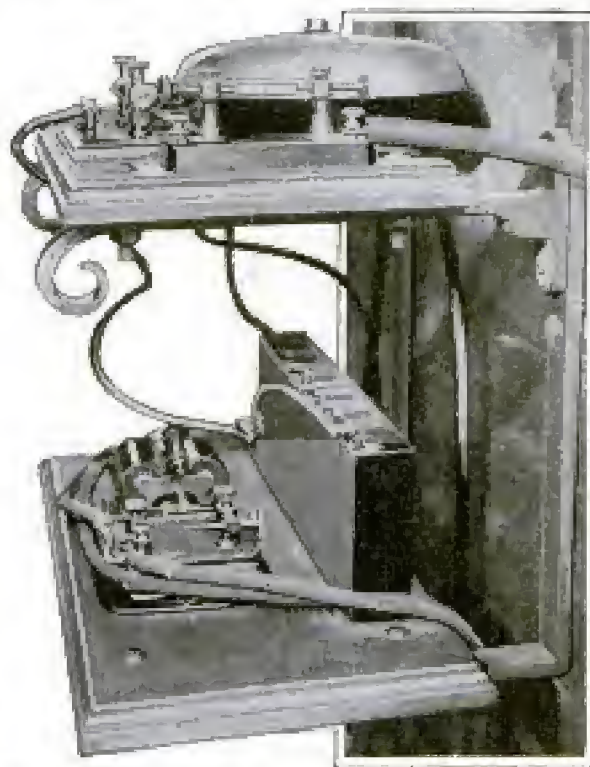
April, when the layer of soil is removed. It is usually well into May before all of the hay is taken away and the trees are raised to their normal positions by means of block and tackle. The ground is tamped about their roots, the braces put in place, and in a few days a blooming orchard stands where there was apparently only a waste field during the winter.

STORM INDICATOR IS USED BY 8611 ELECTRIC COMPANY

An electric-light and power company at Washington, D. C., has developed a wireless apparatus which automatically detects approaching storms and indicates their movements, so that when necessary it is possible to fire extra furnaces and plug in additional generators in sufficient time to meet the heavy load caused by thousands of lights being turned on during daylight hours. The instrument and its equipment consists of an aerial, a coherer, relay, bell, and several dry cells.

When a storm gathers within a radius of 200 or 300 miles the electrical discharges in the atmosphere charge the antenna and pass through the coherer and condensers to the ground. As the current enters the coherer it causes the silver and nickel filings to cohere, thus reducing the resistance sufficiently to allow current to pass from a single dry battery and operate the relay, which in turn closes a six-cell circuit and taps the bell once. As the clapper falls away from the gong it strikes the coherer, separating the filings and placing it in readiness for the next discharge. The distance of the storm determines how often the bell sounds. When it is seven hours away the gong will ring once in 15 minutes, but when only a half hour away the tapping is continuous. A complete table has been prepared which shows the relation between the time intervals in the ringing of the bell and the distance of the storm, so that by timing the former it is possible to determine how far away a storm is and at what speed it is approaching the

city. It has been found, for instance, that when a storm is 59 miles away



This Instrument, in Use by an Electrical Company, Detects Approaching Storms and Indicates Their Distances and Rates of Travel

the bell rings every 15 seconds, and when 280 miles, every 15 minutes.

NOVEL MINIATURE POSTERS 8655 USED FOR ADVERTISING

Miniature posters, such as are reproduced in the accompanying illustration, are being used for advertising purposes by the New York Aquarium. The institution has some two million visitors annually, many of whom purchase these stamps at a cent each and send them broadcast through the mails, pasted on the backs of the envelopes of their letters. By this means the aquarium is given wide publicity entirely without expense, since the popular fad for collecting these tiny posters makes it little trouble to dispose of them.



Zoological Society Bulletin

**"FOR SALE" SIGN MADE OF
CONCRETE LETTERS**

8530m

To avoid disfiguring the premises with the conventional wooden signs, a



Novel Concrete Sign Used by a Los Angeles House Owner for Advertising the Sale of His Property

Los Angeles house owner advertised his property by making seven letters of concrete and spacing them across the sloping lawn so that they formed the words "For Sale." The letters were held in place by wooden pegs driven into the sod. The resulting sign attracted much attention.

**THE BEGINNING OF RAILWAY
BLOCK SIGNALING**

8910m

In December, 1839, or a little more than 75 years ago, the first block system ever installed on any railway was put in service on the Great Western Railway in England. This system consisted in telegraphing the arrival and departure of trains at stations for a short distance out of London, with a rule prohibiting any train from entering a section until telegraphic advice had been received that the train ahead was out of it. Two years later efforts were made to introduce simple instruments showing whether the different sections were clear or blocked. This was the beginning of the present elaborate and efficient systems of block signaling in use on modern railways.

The Indian Railway Gazette
Oct. 1914

**WRIGHT PATENTS VALID IN
ENGLAND**

8835m

The validity of the Wright patents covering certain features of aeroplane

construction has been recognized by the British government by the payment of £15,000 (about \$75,000) to cover both past and future uses of the protected features by the government, as the result of suit brought on account of the use of these devices in the royal air-craft factory. This decision is interesting in view of the hard legal fight in this country in which the Wright brothers established their right to practically basic pat-

ents. The principal feature of the Wright patents is that of warping the wings for controlling the lateral balance.

**SPRIT LEVEL DETERMINES
DEGREES OF ANGULATION**

8848

Besides being suited for use on horizontal, transverse, and vertical planes, a mechanics' spirit level has recently

UNIVERSAL LEVEL TOOL CO.
1111 MARQUETTE BLDG. CHGO.



been invented which is so designed that it will also determine any gradient. The grade-finding device consists of two pairs of graduated, concentric rings, one revolving within the other. Attached to the inside rims of the inner pair is a

This Spirit Level, Besides Doing the Work of the Ordinary Tool, Shows the Degree of Angulation of an Object

The Toledo Indicating
Level Co., Inc. May 1915
1341 Nicholas Bldg.
Toledo, Ohio.

W. D. Goodwin
537 W. 124th St.,
N. Y. City

cylinder which contains the spirit glass. By turning these rings in either direction until the vial is in a horizontal plane, the degree of angulation of an object and also the gradient in fractions of an inch to the foot are indicated. Over each glass is a 2-cp. electric light which enables a workman to read the instrument readily when using it in dark corners.

SAND BOXES AS BASES FOR ELECTRIC-LIGHT POLES

8876

In preparing decorations for the streets of New York on the occasion of a public celebration, a plan for erecting temporary electric-light poles was devised which made it unnecessary to excavate through the sidewalks or pavements. Pyramid-shaped boxes, slightly more than four feet in height,



were filled with sand and used as bases for metal poles between which strings of lights were suspended. The boxes were approximately 34 in. square at the base, while the posts were securely held in concrete so that they were prevented from working out of plumb. Poles of this kind can also be used on temporary street planking during the course of subway construction.

PARCEL-POST RATES SHOWN BY COMPUTING DEVICE

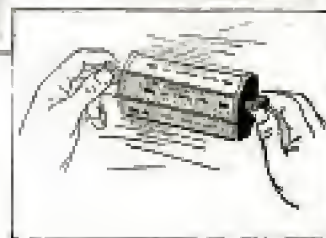
8691

A parcel-post rate-computing device which by a simple manipulation shows accurately the charge exacted for sending a package of specific weight into a certain zone, has been invented by a railway-mail clerk. It consists of an octagonal case, having two holes in each plane, through which the pound

and rate figures may be read. This case houses a cylinder on which a rate sheet is mounted. The openings are



A Simple Device
Which Computes
Parcel-Post Rates
Quickly



offset so that they appear over different columns on the roll chart. By turning the cylinder until the number corresponding to the weight of the package to be sent appears in the left-hand opening in the zone desired, the correct rate is registered. The instrument is made of nicked brass and serves as a paper weight on a desk.

COMBINATION TOOL FOR CLEARING LAND

8481

A handy combination tool has been brought out for the convenience of workmen engaged in clearing land of brush and timber. One side of this tool is so shaped that it can be used as a hook or a brush scythe, while the other side has the form of an ax with a curved blade.

Burgess-Norton
Mfg. Co.,
Geneva,
Ills.



A network of concrete toll roads throughout Texas, exclusively for motor cars, is planned. A fee of one cent a mile, or \$50 a year for general privileges, is to be charged for their use.

Inventor: Clyde Musgrove
Box 606, El Reno, Okla.

Mrs. Avis Gordon Vestal
4243 N. Foster Ave.,
Chicago, Ills.

8 Sept

One Mile Long, a Street Wide, Marshall, North Carolina, Is One of America's Most Strangely Laid Out Cities

Frank H. Zumbel

729 Eighth St.,

Beloit, Wis. POPULAR MECHANICS

409

ODD TOWN OF ONE STREET IN NORTH CAROLINA

8836 H

The town of Marshall, N. C., is approximately one mile in length and one block in width, lying hemmed in between the French Broad River on one side and a range of mountains on the other. In all of North America there is probably not a more curiously laid out town than this one, which has a single street extending through it. Along either side of this thoroughfare is a row of business buildings and dwellings, constituting the city in its entirety. Contrary to what might be expected, the place is not a sleepy little village, but a thriving town of several hundred inhabitants. The available ground space for building purposes is small, and for the most part, when there is to be a new residence constructed, it either replaces an old one or is erected 50 ft. farther along the single street from the center of town than the last one. To protect the place against the contingency of destruction by an avalanche or injury from rolling stones, many of the large boulders on the mountain sides have been chained and braced.

LINEN AEROPLANE WINGS BETTER THAN SILK

8836 M

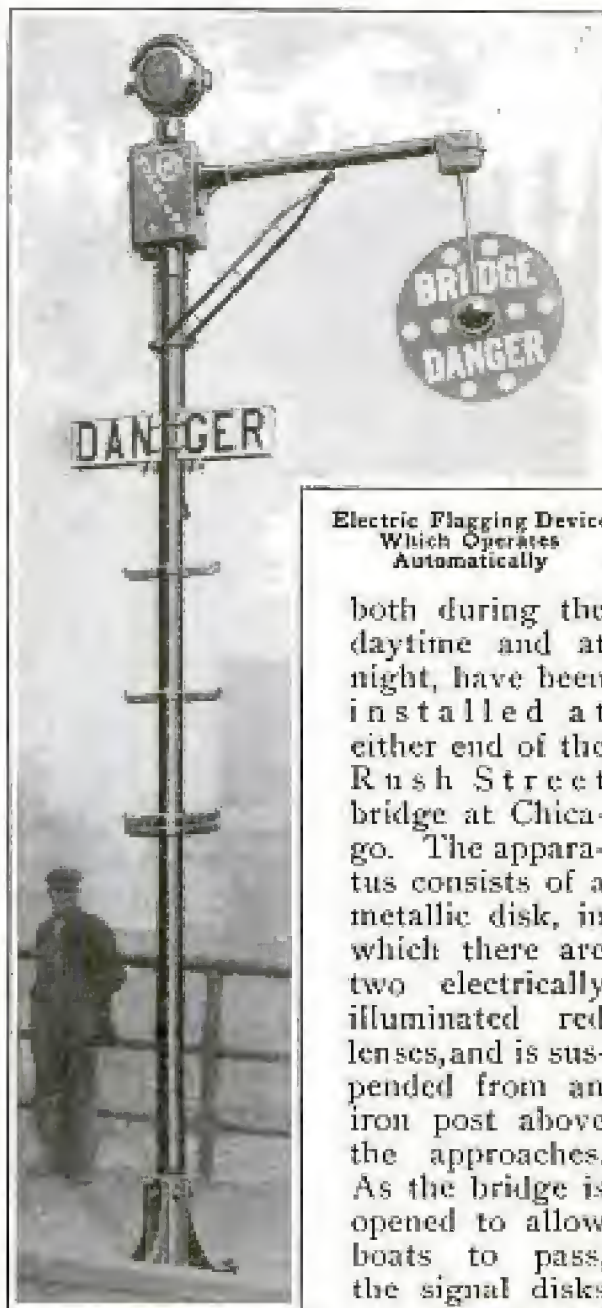
Various kinds of material, including linen, silk, cotton, celluloid films, and aluminum foil, have been tried for covering the wings of aeroplanes, but none has proved so satisfactory so far as linen covered with several coats of a solution of casein. This coating increases the strength of the linen about five per cent, makes it more enduring under varying weather conditions, and causes it to stretch to an absolutely smooth surface, a feature that is of the utmost advantage in fast flights. Silk, which would seem to make an ideal covering on account of its lightness and strength, has been found unsatisfactory, as it does not withstand exposure to sun and rain, and does not lend itself readily to the application of coating compounds.

Scientific American

International News Service AUTOMATIC TRAFFIC SIGNAL

FOR SWINGING BRIDGES

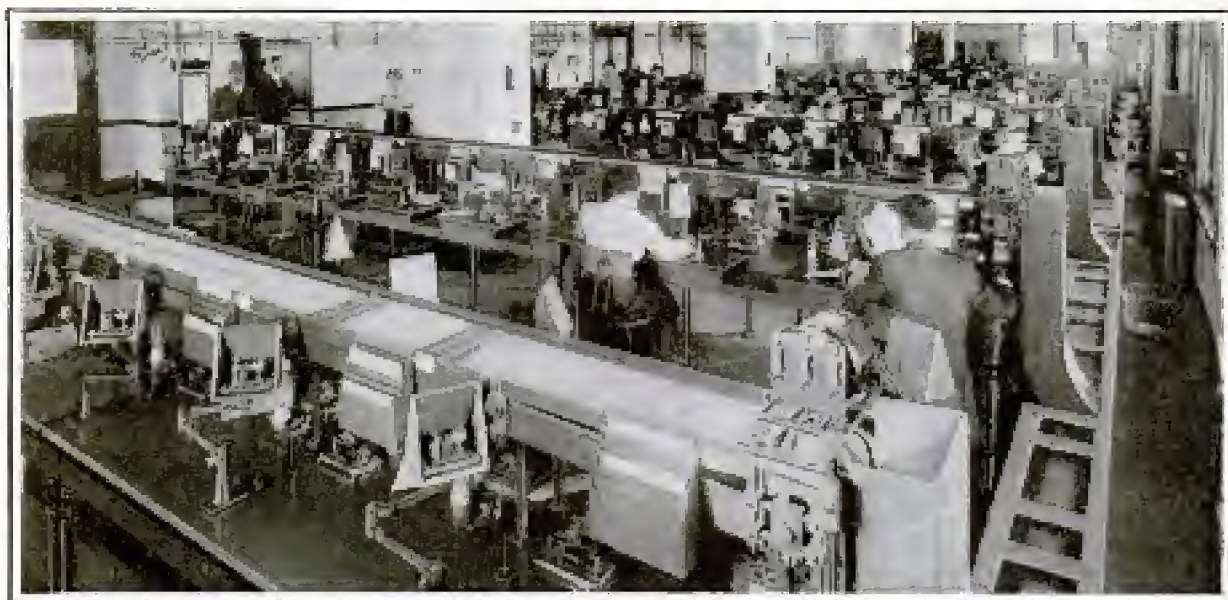
Signaling devices which operate automatically and warn traffic of danger



Electric Flagging Device
Which Operates
Automatically

both during the daytime and at night, have been installed at either end of the Rush Street bridge at Chicago. The apparatus consists of a metallic disk, in which there are two electrically illuminated red lenses, and is suspended from an iron post above the approaches. As the bridge is opened to allow boats to pass, the signal disks are illuminated

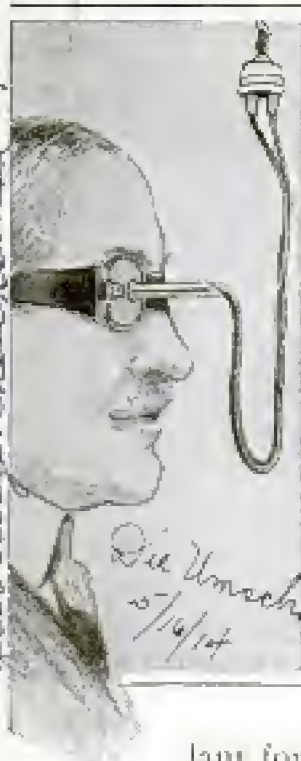
and swung back and forth, while a loud electric gong is also sounded. Each of these functions is performed independently, so that the disablement of one part of the apparatus does not interfere with the operation of the others. Two electric lamps are provided within the disk and so arranged that should one of them be burned out, the other would be cut in by an automatic relay.



In This Telegraph Office the Messages, as Fast as Received and Typewritten, are Tossed on the Moving Belt and Conveyed to the Distributing Table. From the Latter the Messages are Distributed by Pneumatic Conveyors to the Different Divisions Where They are Handled by Girls on Roller Skates

NEW ELECTRIC HEATER FOR TREATMENT OF EYE

A new electrical device for the application of heat in the treatment of the eye has been brought out in Germany. It consists of an electric heating element inclosed in an aluminum case which is curved to fit over the eye and is held in place by elastic bands passed around the head. The device is easily kept clean and is durable.



The use of coconut water instead of acetic acid as a coagulant for the latex or sap of the rubber tree is believed possible in view of a recent discovery which has been made in Ceylon. Experiments indicate that the new method will produce better rubber than is possible by the present method.

DISTRIBUTION SYSTEM OF A BUSY TELEGRAPH OFFICE

In order to save a few minutes in the handling of each message, an elaborate and thoroughly modern system of conveyors has been installed in a new telegraph office at Omaha, Neb., where a great many operators are employed and the business is unusually heavy. Running above the center of each of the long tables at which the operators work is a conveyor belt operated by small electric motors. These belts are placed high enough to be out of the way, but are within convenient reach of the operators. As each message is received and typewritten it is tossed on this belt and is carried to a chute through which it drops to another belt, known as the floor belt. The messages are then carried by the floor belt to the distributing room and dumped on the distributing table. Here they are placed in overhead pneumatic conveyors similar to those used in department stores and distributed to the different divisions, where the final work of distribution is done by girls on roller skates.

Much of the oak wood now used on the Pacific coast is imported from eastern Asia.

Inventor Dr. Carl Emanuel (Augenarz)
 Frankfurt a/M Germany.
 Mfr Veifa-Werke
 Wildungerstr. 9
 Frankfurt a/M.

INCREASING SILK OUTPUT BY NEW CULTURE METHOD

8650 According to what are considered authentic reports, a Japanese silk producer has lately made public a new process of raising silkworms which shortens their life cycle and thereby allows them to be cultured approximately ten times a year instead of only once or twice. It is claimed that the silk made by worms thus raised is not only of a greater quantity, but also of a finer texture than is procured by other means. The method consists simply in immersing the egg cards in hydrochloric acid for five or ten hours. Within a couple of weeks after this operation has been performed the eggs are perfectly hatched, and the resulting worms both stronger and larger than those hatched otherwise. The cocoons of worms bred in this manner usually contain 1,200 ft. of silk fiber, while those of ordinary worms rarely measure more than 700 feet.

SUBMARINE-RESCUE DEVICE

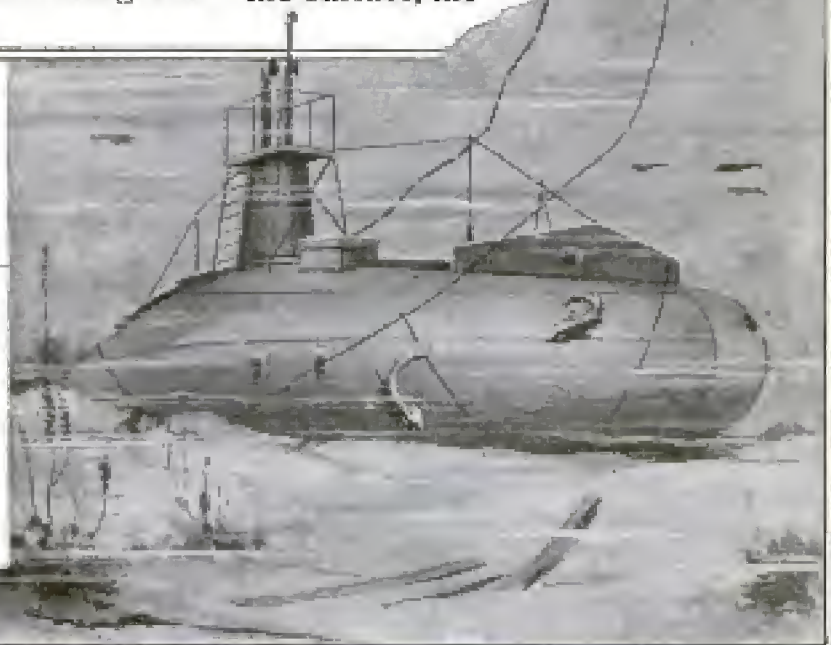
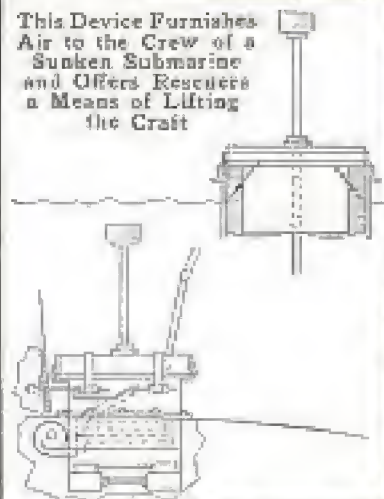
OF NOVEL TYPE

One of the recently invented submarine-rescue devices is designed to furnish the imprisoned crew a supply of air and also extend a line to the surface of the water for facilitating the

raising of the disabled craft. An important part of the apparatus consists of a collapsible box containing an air bag, which when inflated rises to the surface, carrying with it a swivel-jointed pipe within which is a hose. The air for this lifting chamber is taken from the submarine, but as soon as it reaches the surface, the



This Device Furnishes Air to the Crew of a Sunken Submarine and Offers Rescuers a Means of Lifting the Craft



Invented by: Geo. W. Winslow

458 East 47th St.

Chicago, Ill.

pumps in the submerged boat may be set at work sucking in oxygen. A cord which is tied to a cable attached to one end of the craft is fastened to the box. By pulling this up the rescuers are able to obtain a heavy line with which the submarine may be raised. Wires carried by the box establish telephonic communication between those under the water and the rescuers.

NEW HAMMOCK HAS NOVEL FEATURES

A hammock that seems to be the last word in comfort has just made its appearance on the market. It is equipped with the usual pillow and has also a second pillow that serves as a seat and prevents the continual slipping down that often proves annoying in using an ordinary hammock. The foot end is made in three longitudinal sections, and through the openings between these



This Hammock Is Equipped with a Pillow Seat and Has Longitudinal Openings for Resting the Feet on the Ground

sections the feet can be rested on the ground without the necessity for twisting the body to one side. The sections are provided with spreaders so that they are always in position for supporting the feet if desired.

Anita Gordon Vestal

*J. E. Palmer Co., Middletown,
Conn.*

SAVE WARSHIP BY BLASTING ROCK FROM BENEATH IT

After nine months of continual work, the "Tapperheten," one of the largest vessels of the Swedish navy, which was grounded near Stockholm and was at first believed to be a complete loss, has been refloated and again placed in commission. It was found impossible to raise the ship and this left but one method by which it could be saved: that of blasting away the rock from beneath it. The drilling and the planting of the explosives were done by divers, and in six months' time 2,000 tons of stone was removed, allowing the vessel to slide into the water.

TRADE ROUTES THROUGH THE PANAMA CANAL

Nearly 600,000 tons of cargo were carried through the Panama Canal during the first two months that it was in operation, from Aug. 15 to Oct. 15, 1914. This traffic followed fairly well-defined trade routes and may be divided into four groups. The heaviest traffic was between the Atlantic and Pacific coasts of the United States, and this trade was restricted to vessels of American registry. A route between the eastern coast of the United States and the west coast of South America was second in importance, and shipments of grain from the Pacific ports of the United States and southwestern Canada to Europe were third. The fourth route in importance was that from the Atlantic seaboard of the United States to China and Japan, over which were carried mainly shipments of petroleum and petroleum products.

Canal Record, Oct. 28, 1914



Home
A New Way of Expressing the "Home, Sweet Home" Idea

HOUSE WITH MOTTO INLAID
8538 m **IN ROOF**

Instead of hanging "Home, Sweet Home" mottoes in the parlor, as was once the custom, a Pennsylvania builder has expressed the same idea in such a conspicuous way that no one passing the house can fail to see it. Running lengthwise of the roof is the word "Home," worked out in enormous letters by means of slates of different colors.

FORCIBLY FEED BIG SNAKE
8963 **WITH FOOD GUN**

After being imported from India, the largest snake caged in the Lincoln Park Zoo, at Chicago, steadfastly refused to take nourishment and was believed to be gradually starving to death. In the several months of his captivity his weight decreased from 300 to 215 lb. Numerous methods for rousing him were tried without success, until a food gun was purchased and

*J. S. Reid, 506 Belden Ave.
Chicago, Ill.*



Using a Food Gun
to Forcibly Break the Fast
of a Large Snake

the reptile fed forcibly. The instrument is provided with a large cylinder and a plunger actuated by a crank. The snake was taken from his cage, given a hot bath, during which his summer coat was removed, and then placed on a board, 50 ft. in length, at the end of which the food gun with its cylinder, loaded with 20 lb. of chopped pork and beef mixed with fresh pig's blood, was mounted. The strength of 20 men was required to

carry out this operation. A board through which a circular hole was drilled was then inserted between the reptile's jaws, and a tube extending from the nozzle of the food machine passed through this into his throat. The crank was turned, and the meat forced into the snake. Before the operation was finished 50 lb. of the mixture was disposed of in this manner, and the snake was then returned to his cage.

RESTAURANT SIGN APPEALS TO AERIAL TOURISTS

The proprietor of a restaurant at Burlington, N. J., who caters particularly to the trade of motor tourists, has



Unusual Sign Erected by a Burlington, N. J., Restaurant Keeper Which has Attracted Sufficient Local Discussion to Serve as a Profitable Advertising Medium

recently erected a somewhat novel sign ostensibly for the purpose of attracting possible patrons passing the town in air craft. The board which informs airmen that a welcome is waiting them at the emporium is inverted and placed immediately over one directed to automobilists. Because the letters of the aero sign appear upside down, considerable attention has been attracted, arguments stimulated, jokes passed, and the restaurant advertised.

See A. Pollock
Evening Telegraph,
Phila., Pa.

CAUSE OF DUST EXPLOSIONS STUDIED BY GOVERNMENT

On account of the number of fatalities and the great amount of damage resulting from grain-dust explosions during the last several years, the government is now conducting an investigation into the explosibility of carbonaceous dusts for the purpose of discovering, if possible, some means of safeguarding mills and similar industrial plants from this danger. During the last twelvemonth 16 different disasters, which have occurred in recent years, killing at least 80 and injuring 122 men, have been studied. Considerable difficulty has been encountered, however, in obtaining adequate information concerning

explosions at the time of their occurrence, and for this reason it has been urged that all cases, irrespective of the amount of damage done, be reported immediately to the Bureau of Chemistry of the Department of Agriculture.

Records of the Forest Service show that cinders from a forest fire in northern Washington were carried by the wind for a distance of 20 miles.

Information sheet sent out by
Dept. of Agriculture

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8736

FOOTBALL GAME SIGNALLED BY "HUMAN SEMAPHORE"

Every move in a football game at the Harvard Stadium is signaled instantly to the man in charge of the score board by means of an elaborate system of signals made by a man in red sweater and white hat who for years has been known to the thousands who

to play, and to record intelligibly. This system has since been developed from its original simple form to a code that conveys every detail about a play as completely and accurately as if the information had been sent by telephone. In addition to signals repre-



witness the games as the "human semaphore." These signals are made principally with the hands and feet, but many of them require particular postures of the body as well. The system of signaling came into use about 1905, when mass playing was abolished, and when keener strategy and tactics made the game more difficult

senting numbers and the letters of the alphabet, there are single signals that represent the usual features of a football game, such as "touchdown" and "right half back passing to left end." It is estimated that at each game the man who does the signaling travels about 10 miles as he follows the game from one end of the field to the other.

A CONVENIENT ELECTRICAL WASHING MACHINE

8482
A new electrical washing machine is particularly designed for apartments and houses where laundry space is



This Washing Machine Consists of Three Distinct Units, a Motor, Washing Cylinder, and Wringer, Which are Easily Attached to Any Stationary Tub

scarce, since it can be attached to any stationary washtub. This machine consists of three distinct units, a motor, washing cylinder, and wringer. The motor takes its current from any electric-light socket, is light enough to be carried about the house easily, and can be used for other purposes than washing, such as running a sewing machine.

LIST OF PRIME NUMBERS COMPILED IN TABLE

89504
The Carnegie Institution of Washington has published a remarkable book which contains a complete list of all the numbers from 1 to 10,006,721 which are divisible only by themselves and one. The compilation of these prime numbers, which was the work of years, constitutes a valuable contribution to science, for it has been done with the utmost accuracy. Often it is important

to know whether a given number is prime, as in the case of developing theorems relating to prime numbers, and if it be of a large denomination it is often a laborious thing to determine. The table that has been prepared answers such a question almost instantly, while a glance will show exactly how many prime numbers exist between any two given quantities.

MONUMENT TO PIONEER IN PHYSICAL CULTURE

8742m
A novel memorial stone has been erected in Cincinnati to the memory of Friedrich Ludwig Jahn, affectionately known as "Father Jahn," because of his activity in founding the first Turnverein. He was the originator of playgrounds and gymnastic fields in Germany. This monument is 10 ft. high, 7 ft. wide, and 3 ft. thick, and weighs about 30,000 lb. The body of the monument consists of a block of rough-hewn stone on which is a life-size bust of "Father Jahn," carved in the finest Italian marble, and a knotty and storm-beaten German oak.



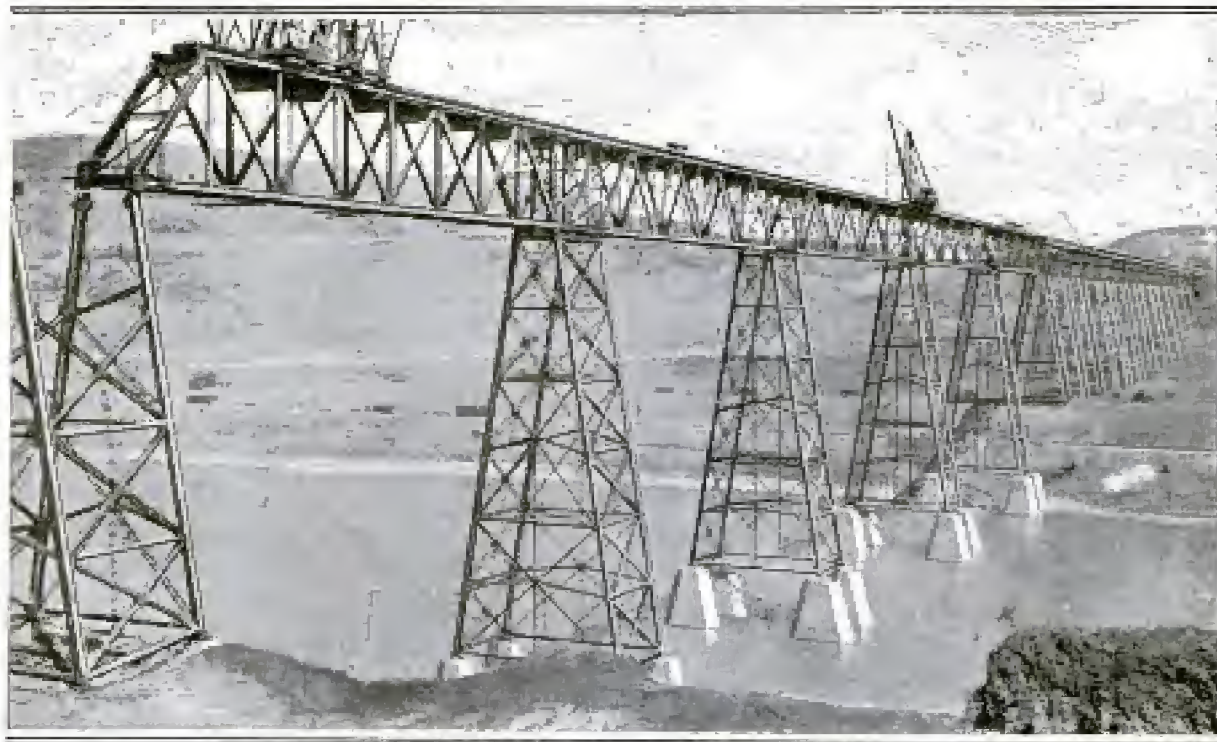
Monument to the Founder of Turnvereins
Recently Erected in Cincinnati

H. E. Zimmerman
Mt. Morris, Ill.

Submitted by Mrs. Ave Gordon Vestal
14243 N. Foster Ave

Science, Dec. 11, 1914

R. W. Fisher
827 Hobson St.,
Walla Walla, Wash.



This \$2,000,000 Railroad Bridge over the Snake River in Washington was Built to Cut Off 52 Miles of Distance between Spokane and Portland

RAILROAD BRIDGE OVER THE 8001 Snake River

One of the most important railroad structures in the West is a bridge just completed over the Snake River in Washington, which cuts off 52 miles of the distance between Spokane and Portland, and cost about \$2,000,000. The bridge stretches from bluff to bluff and is 4,000 ft. in length. The approaches are steel trestles, while the river portion consists of steel-truss spans carried on steel towers, each of which is supported on four concrete piers. The track is 285 ft. above the water, and the concrete piers extend down to bedrock from 18 to 30 ft. below the water.

FARM TRACTOR COSTS LESS 8806 THAN TEAM OF HORSES

Large farm tractors have been in use for years on the large farms and ranches of the West, where they long ago demonstrated their worth and economy. The initial cost and expense of operation of these machines, however, makes them anything but economical for the smaller farms of the

East and Middle West. This condition is being met by the development of light tractors that cost less than a good team of horses, are operated at less cost than providing feed for a team, and are powerful enough to do plowing and other kinds of farm work. A new machine of this class which is exceedingly simple in construction is shown in the illustration.



Farm Tractor That can be Economically Used with a Single Plow

Fred Telford
605 S. Douglas Ave.,
Springfield, Ills.

Bull Tractor Co.,
Minneapolis, Minn.
Copyrighted material

Miss Dorothy Scarborough
717 Speight St.,
Waco, Texas.

418

POPULAR MECHANICS

David Lindsay,
White Star Line
9 Broadway, N.Y. City

PASSING OF THE LONGHORN

8763 # CATTLE OF SOUTHWEST

It is only a few decades ago that the longhorn cattle of the Southwest ran rampant over the unfenced ranges in herds of thousands, yet today they are practically extinct. The grazing lands of the plains for the greater part have been cut into farms, and cattle ranches



Horns of Some of the Wild Cattle Once Grazing in Herds of Thousands on the Ranges of the Southwest

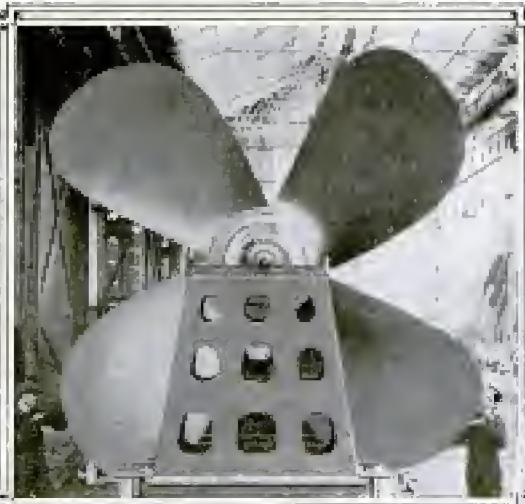
as they once were are rare. It is partly because the longhorn takes up too much room and is a dangerous creature in close confinement that it has been supplanted by other breeds. For this reason good specimens of the horns of these rapidly disappearing wild cattle are valuable. The accompanying photograph shows several pairs, the longest of which measures eight feet and some inches from tip to tip. They were taken from one of the finest collections in Texas.

INSTALLING THE EQUIPMENT

7835 OF THE "BRITANNIC"

One of the three biggest ships in the world is the "Britannic," now nearing completion at Belfast, Ireland. Originally planned for the transatlantic passenger service, the exigencies of the war may cause it to be diverted to military purposes. Much of the equipment for this vessel has already been made and installed, and an idea of the immensity of some of the parts is given in the accompanying illustrations. Power for driving the "Britannic" across the Atlantic at the estimated speed of 22 knots, or 25½ miles an hour, is to be supplied by 29 boilers, each 16 ft. 5 in. in diameter, 21 ft. 10 in. long, and weighing 105 tons. Connected with these will be four funnels of elliptical cross section, the two diameters of each funnel being 24 ft. 6 in. and 19 ft. 10 in. The tops of these funnels will stand 150 ft. above the furnace grates. In the two condensers there are 19,240 tubes, which, if placed end to end, would reach 50 miles. The vessel will be driven by three propellers, of which two are to be operated by reciprocating engines, and one, the center propeller, by a Parson's turbine, capable of developing about 10,000 hp. when running at 165 revolutions a minute. This turbine operates on the steam exhausted from the reciprocating engines, receiving the steam at 24 lb. absolute pressure, and exhausting it at 16 lb. The rotor alone, which is 16 ft. 11 in. in diameter and 13 ft. 8 in. long between the first and last rings of blades, weighs 145 tons, while the entire turbine weighs 420 tons. The blades range from 18 in. to 25½ in. in length. The center propeller has four blades, and consists of one solid piece of manganese bronze. It weighs 22 tons and has a diameter of 16½ ft. The blades in the turbine number 58,916, and if placed end to end they would reach 12½ miles.

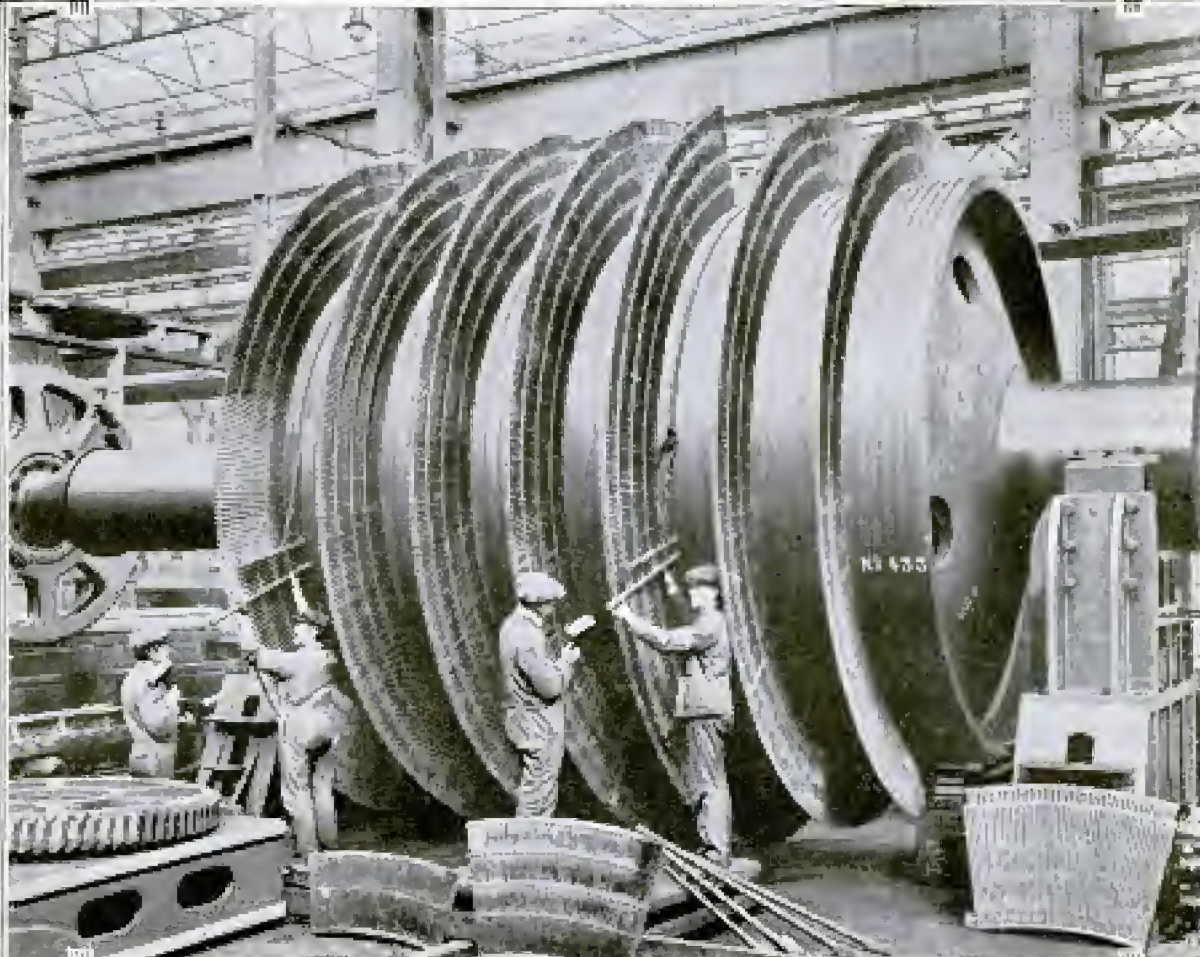
¶An automatic sewage-pumping station, having a daily capacity of 151,000,000 gal., and said to be the largest in the world, is being built at Boston.



The Center Propeller, Driven by the Parsons Turbine, Is One Solid Piece of Manganese Bronze Weighing 22 Tons



Hoisting One of the Four Funnels on Board the "Britannic": These Funnels are Elliptical in Cross Section and of Enormous Size, the Two Diameters of Each Funnel Being 24 Feet 6 Inches and 19 Feet 10 Inches. When Installed, the Tops will Stand 150 Feet above the Furnace Grates. About 20 Uptake Branches Connect Each Funnel with the Furnaces



Putting the Blades in the Parsons Turbine: The Blades in This Turbine, 55,948 in Number, would Reach 12 $\frac{1}{2}$ Miles If Placed End to End

Albert Maple, 322 Baynton St.,
Tropic, Cal.

STONE TREE FORMS BRIDGE

8201H OVER WIDE RAVINE

Spanning a wide ravine near Flagstaff, Ariz., is a natural bridge which



This Petrified Tree, Which Is More Than 100 Feet in Length,
Spans a Ravine and Forms a Natural Bridge

constitutes such an unusual curiosity that the government has undertaken to protect it against possible injury. It is in reality a petrified tree, approximately $3\frac{1}{2}$ ft. in diameter and 125 ft. in length, which apparently rests where it originally fell after being blown down during a heavy storm. In order that it may not be destroyed, strong concrete piers have been constructed to support it.

THE "DEMOLOGOS," FIRST
8830m STEAM WAR VESSEL

In comparison with the dreadnaughts of the present day, the "Demologos," the first steam war vessel ever built, furnishes some interesting contrasts. This ship was 167 ft. long. It made its first speed trial on July 4, 1814, and developed a speed of a little more than six miles an hour, which was thought to be very good at that time. The "Demologos" never engaged in battle. On June 4, 1829, the ship was destroyed in the New York navy yard by an explosion of its boilers, which killed 29 persons. Some of the naval launches of the present time have a greater horsepower than that of the "Demologos."

Marine Journal

Reclams Universum
WEAVING DRESS FABRICS
8451 FROM WOODEN THREAD

Commercial chemists in Great Britain have recently devised a simple process for manufacturing dress goods from wood. In appearance the cloth bears quite a close resemblance to silk. The fabric is made by cutting wood into thin sheets and treating it chemically so that it is converted into a thick fluid. This is passed through a series of heated pipes so that the moisture is evaporated rapidly and the product changed into a solid which passes through a fine-mesh screen in the form of thread. These hairlike strings are then given a chemical bath, thoroughly dried and woven into fabrics. The resulting cloth has a silky gloss and is produced very inexpensively.

REQUIRED HEAT MAINTAINED
7567m BY NEW CANNER

For complete success in canning, the fruit or vegetables should be subjected to a temperature considerably higher than the boiling point of water, but it is impossible to obtain a higher temperature than this when the filled cans are boiled in an open vessel, as the excess heat passes off in steam as fast as it is produced.

A canning vessel now being introduced is designed to overcome this obstacle and to furnish a means for obtaining any temperature required for canning and to maintain that temperature as long as may be



Infgr: West Infgr. Co.
662 Bullitt Bldg.,

Phila. Copyrighted material

necessary. This canner is in effect a steam chest, being provided with a close-fitting cover and water seal that confines the steam. On the cover is a thermometer which shows at a glance just what the temperature is inside the vessel. The size for ordinary household use holds 17 three-pound cans or 11 one-quart glass jars.

Army & Navy Jour.

COST OF RAISING HORSES AND AMERICA'S SUPPLY

8954 *in*

In spite of the constantly growing use of motor vehicles and mechanical devices on the farm and in the city, the United States today possesses nearly one-fourth of the horses of the world. At the beginning of the Civil War there were approximately 5,000,000 horses scattered through the various states, while during that conflict, it is estimated, more than 250,000 were killed annually. The number of horses now in this country approximates 23,000,000. The government maintains three breeding stations which have been in existence for some time, and while it has attempted to develop animals suitable for military purposes, it has been unable to bring them to an age of three years for a cost less than approximately \$1,000 each, it is claimed. At the same time \$150 is the amount which it offers in the open market for horses, a price which raisers assert the government's experiments show to be less than the actual cost of breeding and raising good stock.

WAR VEILS THE LATEST

PARISIAN FASHION

8940 *in*

French women have found a new way of expressing their patriotism by wearing veils in which war emblems are woven. These war veils are grotesque in appearance and scarcely add to the beauty of the wearers, but they have nevertheless become a popular style, especially in Paris. One type of veil has a black cannon woven in the mesh just where it rests on the cheek. Another popular veil has a



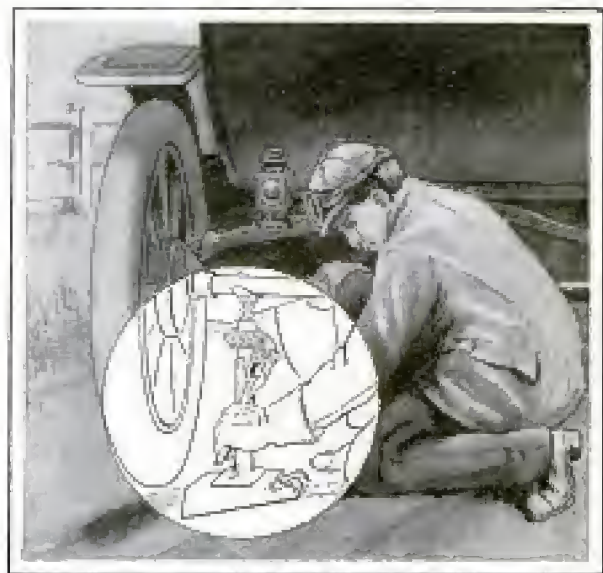
Veils Like These, Carrying Emblems of War, are Worn by French Women for Expressing Their Patriotism

"beauty spot" woven to the shape of the Red Cross, but done in white on a black background.

BASE FOR ADJUSTING JACK ON SLOPING GROUND

8946 *in*

A simple device intended for the convenience of motorists is a base to be used with a lifting jack, with which the jack can be placed in a vertical position on a sloping road or can be used in sand or mud. This base gives a much greater bearing than the base of the jack and is wedge-shaped so that it can be swung on a slope to give the jack a level footing.



Automobile Jack with Adjustable Base

Motor Age - July 30, 1914
Goodnow Bldg. Co. Boston,
Copyrighted Material

PRIVATE WIRELESS STATION OF GREAT POWER

8002 m

What is probably the largest private wireless station has just been installed in the city hall at Minneapolis, Minn., by a noncommercial organization of wireless experts and amateurs, known as the Minneapolis Wireless Association. The instruments in this station have been arranged with particular reference to experimental work, which will include tests and comparisons of new apparatus, studies of stray electrical disturbances, and the development of new apparatus. The aerial, which consists of 11 wires stretching between the two towers of the building, is 400 ft. above the ground at the upper end. This station has a receiving range of 4,000 miles and a sending range by the power special li station to be length of

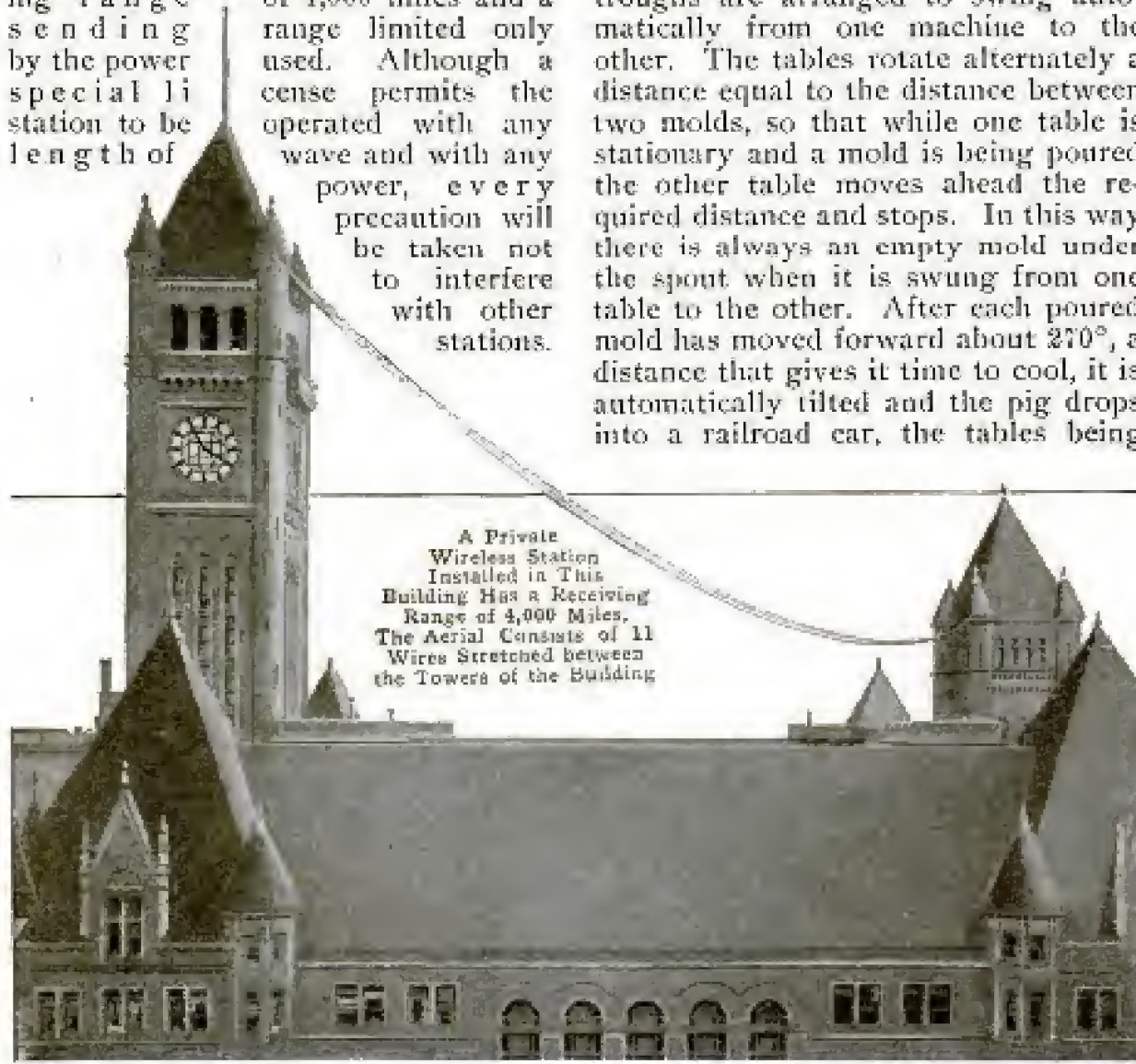
of 4,000 miles and a range limited only used. Although a cense permits the operated with any wave and with any power, every precaution will be taken not to interfere with other stations.

A wireless telephone set, to be operated in connection with the station, is now under construction.

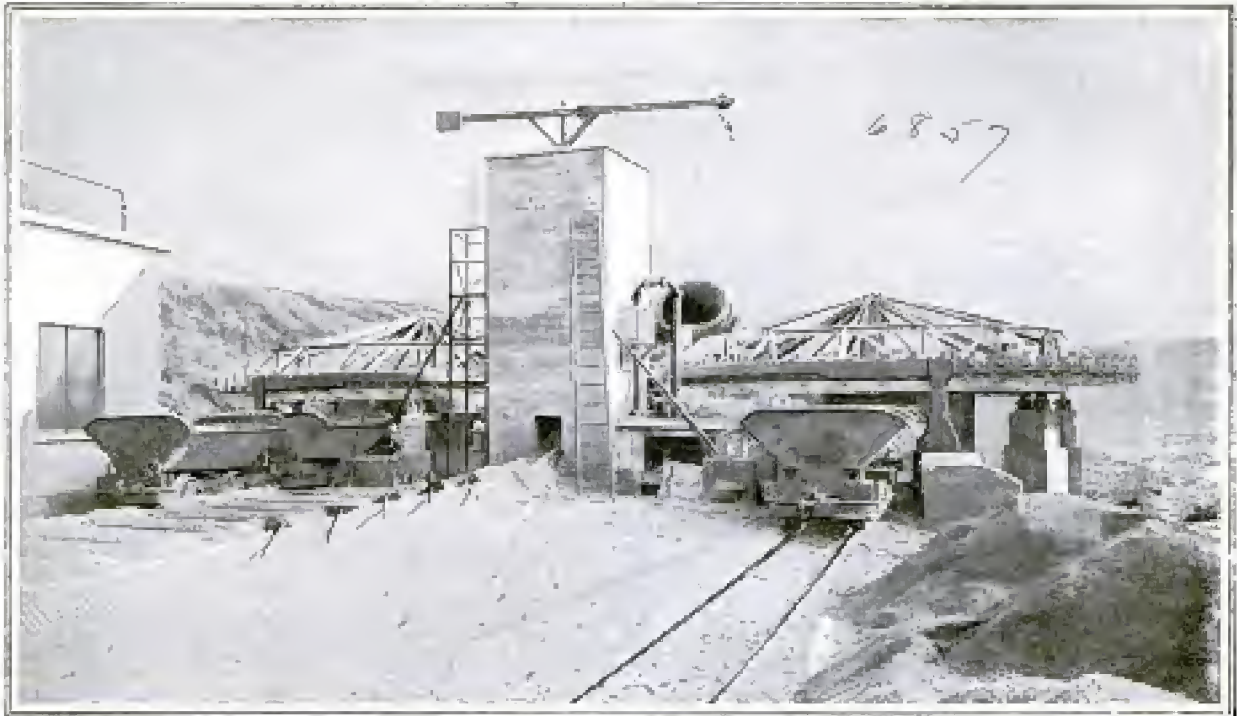
AUTOMATIC PIG-CASTING

6857 m MACHINE

A horizontal pig-casting machine that is capable of turning out from 20 to 30 tons of small-sized pigs an hour is being successfully used in Germany. This machine is in effect two turntable machines that work in conjunction and are served by one ladle and pouring trough, with 64 horizontal molds arranged radially between two concentric rings in each table. The ladle is placed on pivoted bearings between the two machines and adjacent to the blast furnace for filling, while the pouring troughs are arranged to swing automatically from one machine to the other. The tables rotate alternately a distance equal to the distance between two molds, so that while one table is stationary and a mold is being poured the other table moves ahead the required distance and stops. In this way there is always an empty mold under the spout when it is swung from one table to the other. After each poured mold has moved forward about 270°, a distance that gives it time to cool, it is automatically tilted and the pig drops into a railroad car, the tables being



A Private
Wireless Station
Installed in This
Building Has a Receiving
Range of 4,000 Miles.
The Aerial Consists of 11
Wires Stretched between
the Towers of the Building



In This Pig-Casting Machine the Two Turntables Carrying the Molds Work in Conjunction and are Served Alternately by One Ladle and Pouring Trough; the Machine Is Capable of Casting from 20 to 30 Tons of Metal an Hour

placed high enough to permit a car to be run under them. The entire machine is driven by an electric motor of 10 hp. It is adapted not only for casting pig iron but for casting copper, zinc, lead, and other metals.

NEW DISHWASHER WORKS

8454 2m AUTOMATICALLY

In a new dishwasher the dishes are cleaned by the impact of water thrown upward among the dishes by a rapidly revolving "dasher." The outer case of the machine has a funnel-shaped bottom and in this the dasher revolves without any danger of striking the lower tray on which the dishes are placed. Two wire trays, placed one above the other and supported independently of each other, are used, the lower tray being used for dishes and plates, and the upper for cups, saucers, and other small articles. In the middle of the lower tray is a compartment in which knives, forks, and spoons are stood on end. The trays are so made that dishes of various shapes and sizes are held securely on edge. The machine is made for operation either by electric power or by hand. In the

electric machine the dasher makes 310 revolutions a minute, and in the hand-operated machine it makes three revolutions for each movement of the handle. In using, all that is necessary is to fill and place the trays in the machine, put in water and soap and start the dasher going.



Section of New Dishwasher, Showing How the Dishes are Arranged in Trays above the Dasher

Walker Bros. Co., 225 Walton St., Syracuse, N.Y.

Elect. 65. 80. 110.

Hand. 24. 30.

Copyrighted material

766 **TO GROW TIES FOR THE
RAILWAYS OF AFRICA**

A "tie plantation," planted about five years ago in Cape Colony, for supplying the railways of South



An Evergreen Lane in the "Tie Plantation" of Cape Colony

Africa with ties, has now reached such a state of maturity that the first cutting of the trees is soon to begin. Heretofore practically all the ties for the South African railways have been imported from Australia, and in late years the cost has averaged about \$1.75 apiece. On account of this high cost it was decided to try planting a forest of native evergreens as a source of supply, previous experience with the evergreen wood having shown that it was suitable for tie material.

☞The Post Office Department has authorized postmasters to furnish patrons information by telephone regarding parcel-post rates and packing requirements.

8935H

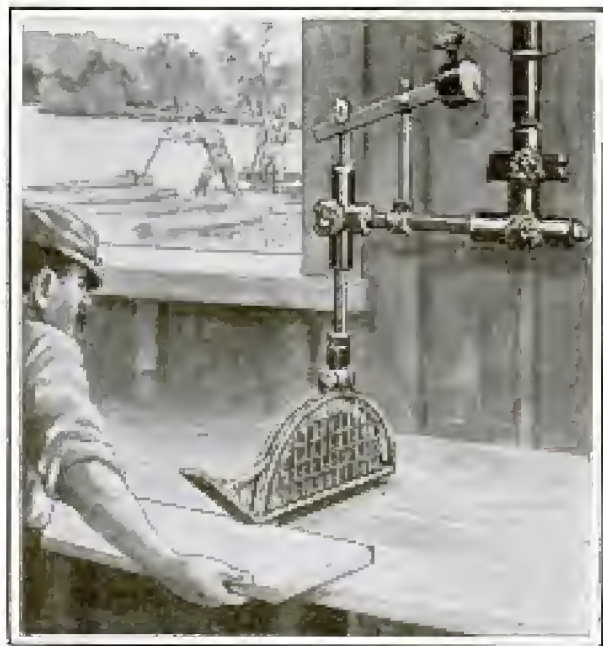
**DISCOVER NEW METAL ALLOY
WITH VALUABLE PROPERTY**

Having a coefficient of expansion amounting to only .0000004, a new metal alloy has been discovered which is especially valuable for precision pendulums. The composition of the material has been kept secret and its name, "indilatans," is derived from its insensibility to varying degrees of temperature. Although it is surpassed in this quality by quartz, it has, when used for a pendulum, the advantage of being simpler in construction and more easily transported.

AUTOMATIC GUARD FOR

8361 **CIRCULAR SAWS**

A guard for circular saws, now being introduced, is connected by a swivel joint with an arm that projects down from the ceiling, or with an upright clamped to the side of the table, so that it is free to rise as the wood goes through, but falls back instantly into place as soon as the wood has passed beyond the saw. The nosepiece of the guard is adjustable for any thickness of lumber. When up-end work is to be sawed, the swivel joint makes it easy to swing the guard out of the way.



This Saw Guard is Lifted Automatically as the Wood Goes Through, but Falls Instantly into Place as Soon as the Wood Has Passed the Saw

Mfg. by: Cass Brothers
82 Walker St.,
New York City



This Earth Mine Consisted of Only 25 Pounds of Black Gunpowder

CANADIANS DRILLING WITH 8673 FIELD MINES

Every form of military movement and practice is included in the training of the Canadian recruits who are preparing for active service in Europe. One of the most spectacular of these drills is that of the placing and exploding of field mines by the military engineers. The severe nature of these explosions is shown in the photograph of a mine set off on Garrison Common, Toronto. Only 25 lb. of black gunpowder was used, but earth and fragments of rock were thrown 300 ft. into the air, while a hole, 5 yd. square, was made in the ground.

CURIOUS VEHICLE MADE OF 8552 ODDS AND ENDS

Because of lack of funds or a disinclination to spend any money on transportation, an enterprising homesteader in Montana built a two-wheeled cart from odds and ends picked up about the railroad station, loaded his slight belongings on this curious vehicle and then trundled it across 35 miles of country to his homestead. The rims of the wheels are made of saplings bent as nearly as possible to a circular shape.

Dr. J. P. Regan
Bloomfield, Neb.

The rim of each wheel is held and thoroughly braced to this shape by barbed wire stretched back and forth after the fashion of wire spokes, the result being a suspended wheel working on the principle of a bicycle wheel. The wires are wound around the ends of a scantling, which serves as an axle and revolves with the wheels. The middle of this axle was rounded with an adz and from this the load was suspended by wire loops. This improvised cart stood the trip very well, although it was loaded with a trunk, bedding, a box of chickens, and a roll of fence-wire netting.

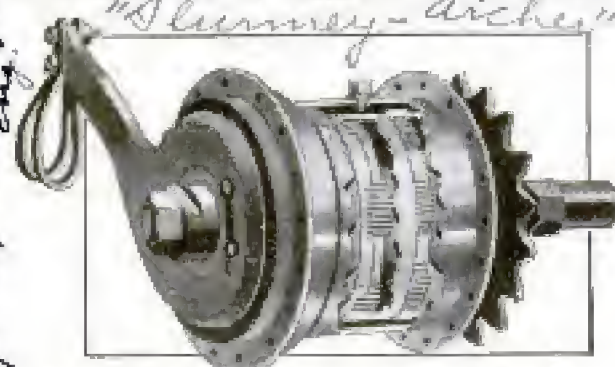


This Cart, Made of Saplings, Barbed Wire and a Scantling, Carried a Heavy Load 35 Miles

*Cycle Mfg + Supply Co.,
180 N. Dearborn St.,
Chicago, Ills.*

THREE-SPEED HUB IS MADE FOR USE ON BICYCLES

Although it has been in common use in Great Britain and on the European continent for a number of years, a



Bicycle Hub Which Provides a Brake, Coaster, and Three Speeds

three-speed gear designed for use on bicycles has only recently been introduced in this country. The mechanism consists of two sets of gears arranged

on the epicyclical principle. The shifting is done by means of a wire, operated by a thumb lever attached to the handle bars, which extends to the hub axle. On low speed both trains of gears are in operation; on second, both are locked so that the hub revolves normally, and on third, one train of gears is placed in service. The cycle may be wheeled backward on any gear, or the brake used at any time. The advantage of more than one speed is that a cyclist encountering a hill or stretch of heavy road may reduce his gearing, while a high gear is also available for racing purposes.

Four fast cruisers to cost about \$12,000,000, six torpedo boats, 28 submarines, and three gunboats, as well as a general development of coast defense, are provided for in a bill introduced in the Spanish chamber of deputies.

ELECTRIC MOTOR OPERATES SEWING MACHINE

A small and compact electric motor designed for running a sewing machine



How the Electric Motor is Applied to a Sewing Machine

alternating current and may be run by connection with any electric-light socket. It may be used with any type of machine, and is easily detached when not needed. The application of the motor in no way interferes with the ordinary working of the machine. It is started and stopped by a lever at the will of the operator.

SHIPPING PLANTS BY PARCEL POST

As a result of the amendment to the parcel-post regulations permitting the shipment of plants and bulbs at regular parcel-post rates, it is expected that there will be a tremendous increase in the business of post offices located in plant-growing sections. At one town in South Carolina having not more than 50 inhabitants, the annual business has heretofore been about \$5,000, made up largely of

advertising sent out by the plant growers. In anticipation of the effect of

*L. H. Hamilton
Wisconsin Electric Co.,
Racine, Wis.*

Christian Science Monitor

*10/27/14
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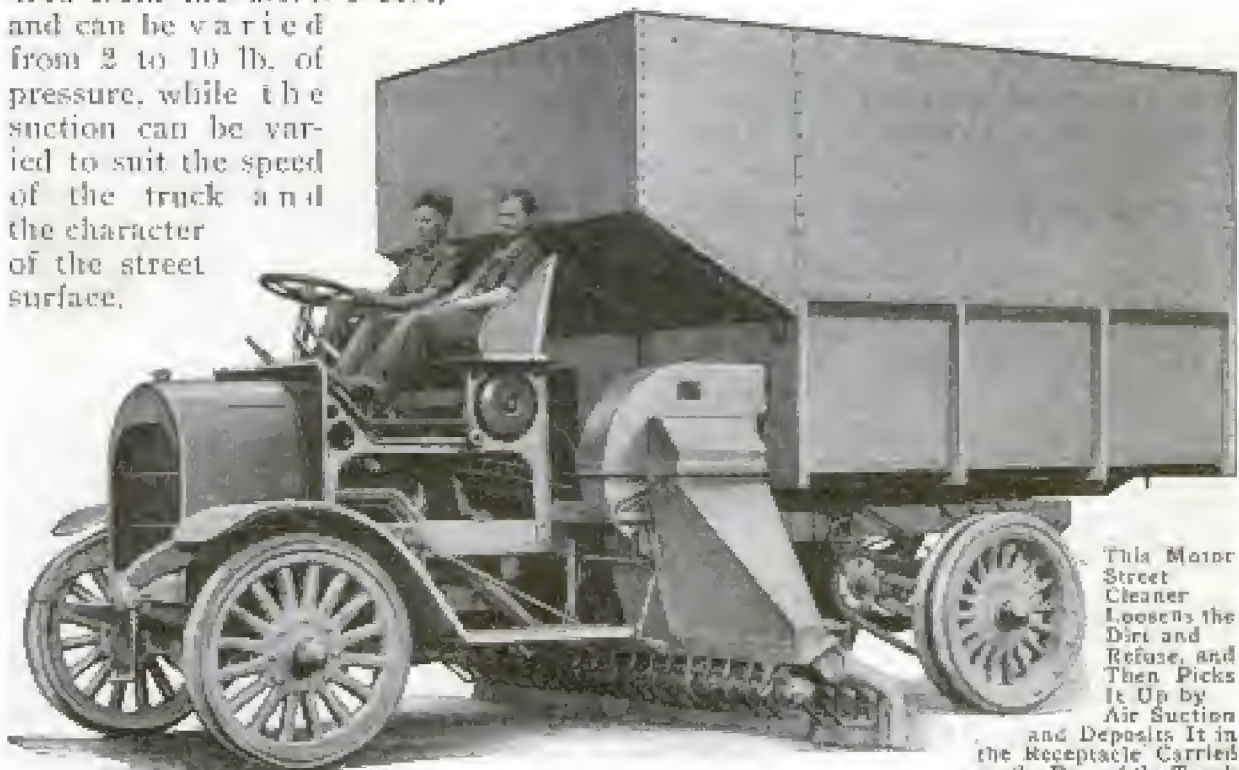
J. V. Schroeter
1321 East 56th St.,
Chicago, Ill. 427

POPULAR MECHANICS

the new regulation the postal authorities are arranging facilities for handling \$2,000 of business a day at this point, or about 25 tons of plants and bulbs.

MOTOR STREET CLEANER 8319_m USES AIR SUCTION

One of the latest features in street cleaning is a motor truck equipped with apparatus that loosens and breaks up the dirt and refuse on the street, and then picks it up by air suction and deposits it in a receptacle carried at the rear of the truck. The lower ends of the suction pipes are made of flexible material so that they fit irregularities in the street surface, while the pipes at the sides of the truck are so made that they are not injured by contact with the street curb. The dirt and refuse is broken up by oscillating brushes as the truck moves along the street, and is picked up by the suction pipes placed close behind the brushes. One engine, by means of two sets of controls, supplies the power both for propulsion and for operating the cleaning mechanism. The brushes and suction pipes are easily raised and lowered from the driver's seat, and can be varied from 2 to 10 lb. of pressure, while the suction can be varied to suit the speed of the truck and the character of the street surface.

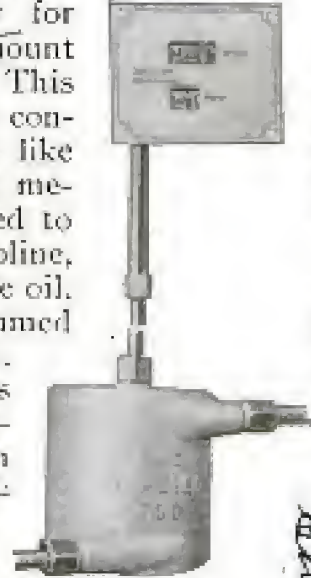


This Motor Street Cleaner Loosens the Dirt and Refuse, and Then Picks It Up by Air Suction and Deposits It in the Receptacle Carried on the Rear of the Truck

Sanitary Vacuum Street Cleaner Co.,
Minneapolis, Minn.

Mfr: The Fuel Meter Co., 929 E. 5th St.,
METER TELLS AMOUNT OF OIL
8868 R. 516-29 So. La Salle St.,
CONSUMED Chicago, Ill.

A recent invention of interest to motorists, and to users of internal-combustion engines generally, is a meter for measuring the amount of fuel consumed. This meter is simple in construction, is much like an ordinary water meter, and is intended to be used with gasoline, petroleum, or crude oil. The amount consumed is shown on a dial. When the meter is used on an automobile it is an easy matter to determine by comparison with the odometer the exact amount of gasoline used per mile of travel.



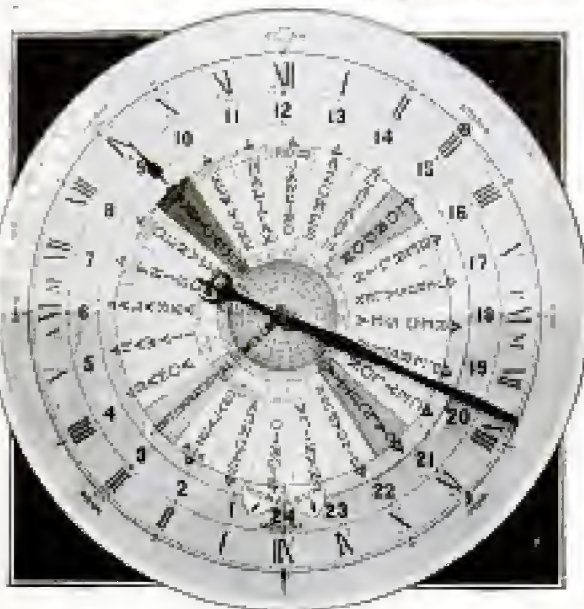
C. P. Blackley (Inventor)
22516 29 So. La Salle St.,
Chicago, Ill.

Wooden piles, 114 ft. in length, are used in supporting the falsework of a railroad bridge over the Mississippi River at Memphis, Tenn.

CLOCK SHOWS TIME AROUND THE WORLD

8844 m

A clock showing the correct time of day and the longitude for every part of the world has been adopted and in-



This Clock, Now being Introduced in Public Schools, Shows the Correct Time and the Longitude for Every Part of the World

stalled in the Chicago public schools. This clock has two dials, one of these being stationary and the other making one revolution each 24 hours. The stationary dial is the same as that of an ordinary clock except that it is a 12-hour and 24-hour dial combined. The new feature about the clock is the revolving dial, which represents the earth

revolving on its axis from west to east. This is divided into 24 sectors, each representing 15° of longitude, or one twenty-fourth of the earth's circumference, and in each of these sectors is the name of the principal city or island within the longitudinal boundary. Not only does this dial show the time of day in each of the sectors but it also shows at a glance which of two days it is at any point. This is accomplished by the international date line marked on the revolving dial and used in connection with a small dial on which two successive days of the week show at one time. One of the advantages of the clock for school use is that it demonstrates clearly how the sun stands still and the earth revolves on its axis.

SIAMESE RICE-GRINDING

8507 m MACHINE

Crude but effective machines of a type that was in common use centuries ago, are still used by the natives of Siam for grinding rice. The grinding is done by two roughly hewn stones, the upper of which is rotated back and forth by a lever having one end slung to a wooden support, as shown. The rice is placed in a basketlike hopper, and after being ground it falls into a sort of trough placed around the support.

This Machine for Grinding Rice is of a Type That has been in Use by the Natives of Siam for Centuries. The Rice is Ground between Two Roughly Hewn Stones. One being Rotated Back and Forth by the Bamboo Arm Slung from the Wooden Support



Henry Busch, 108 Fulton St.,
N. Y. City.



Car Ferry Which is to Serve as Bridge
for Railway between Key West
and Havana

FERRY WHICH WILL BRIDGE 8212 DISTANCE TO HAVANA

One of the largest car-ferry steamers ever constructed has been launched and is expected to be ready for the inauguration of "railway communication" between Key West, Fla., and Havana, Cuba, early this year. The vessel will have a carrying capacity of 30 freight cars and will make the 96-mile voyage in approximately eight hours. Its hull is built of steel; its length over all is 350 ft.; its breadth of deck, 57 ft., and its depth, 22 ft. The main deck is fitted with tracks upon which the cars will be carried, while its stern is shaped to fit into the docks provided at the two terminal points. The weight of the cars will be supported upon jacks, after they are loaded aboard the vessel, so that the trucks will be relieved from the added strain caused by the rolling of a ship.

BARBER SHOP HAS NOVEL 7790 SYSTEM OF FANS

A simple method for keeping flies away from the customers while they are being barbered is in use in a barber shop in Racine, Wis. Over each chair, and just above the head of the cus-

tomers, is a Japanese fan suspended from the ceiling by a rubber band. An electric fan at the end of the room is directed at these fans so that the current of air keeps them swinging. When the barber has finished giving a shave, he uses the suspended fan in place of the regulation palm-leaf fan for drying the customer's face.



Simple but Effective Fan System in Use
in a Wisconsin Barber Shop

M. E. Duggan, 472 Chicago St., Kenosha, Wis.
In Barber shop of George L. D. Hute, Racine, Wis.



Infantrymen Using Their Intrenching Tools as Shields While Moving the Firing Line Forward

USING INTRENCHING TOOL AS SHIELD IN BATTLE

British military authorities are considering a plan for utilizing the intrenching tool of the infantryman as a shield against rifle fire. This would entail the adoption of an implement somewhat different in form from that now in use, and preferably one about the size of the ordinary turf-cutting spade, with a thickness of approximately three-sixteenths of an inch, which would be capable of turning a projectile at 250 yd. Instead of being carried in the haversack, the blade would be worn over the abdomen, its point resting on the breastbone. Within the fire zone on the battle field the plate would be used to assist in the continuous advance of the line. A rear-rank man would hand his implement, for instance, to an odd number, who would make a rush under cover of his comrade's fire, carrying the tool as a shield, his own implement at the same time being strapped in place to protect his stomach. The pick end of the spade would be thrust in the

ground in front of a soldier as he threw himself down at the end of a rush. Then, using his own implement, he would dig himself in behind the cover thus provided. Next, he would dig a place for his comrades, who at the signal would rush with the even numbers. As soon as it would be time for the next advance, the even numbers would take the intrenching tools and repeat the operation. One point about this plan worthy of notice is that members of the rear rank would be deprived of head shields while their comrades were making a rush and digging in. It is reasoned that this would give them an incentive to move forward at an order and occupy the sheltered positions prepared for them.

MUNICIPAL SERVICE TRUCK WITH RADIO EQUIPMENT

For use in the maintenance of the municipal conduit system of Baltimore, the electrical commission of that city is employing a new service motor truck which in addition to its other equipment is provided with a wireless

Curth M. Pippin
2950 Clifton Ave.,
Baltimore, Md.

Army & Navy Journal

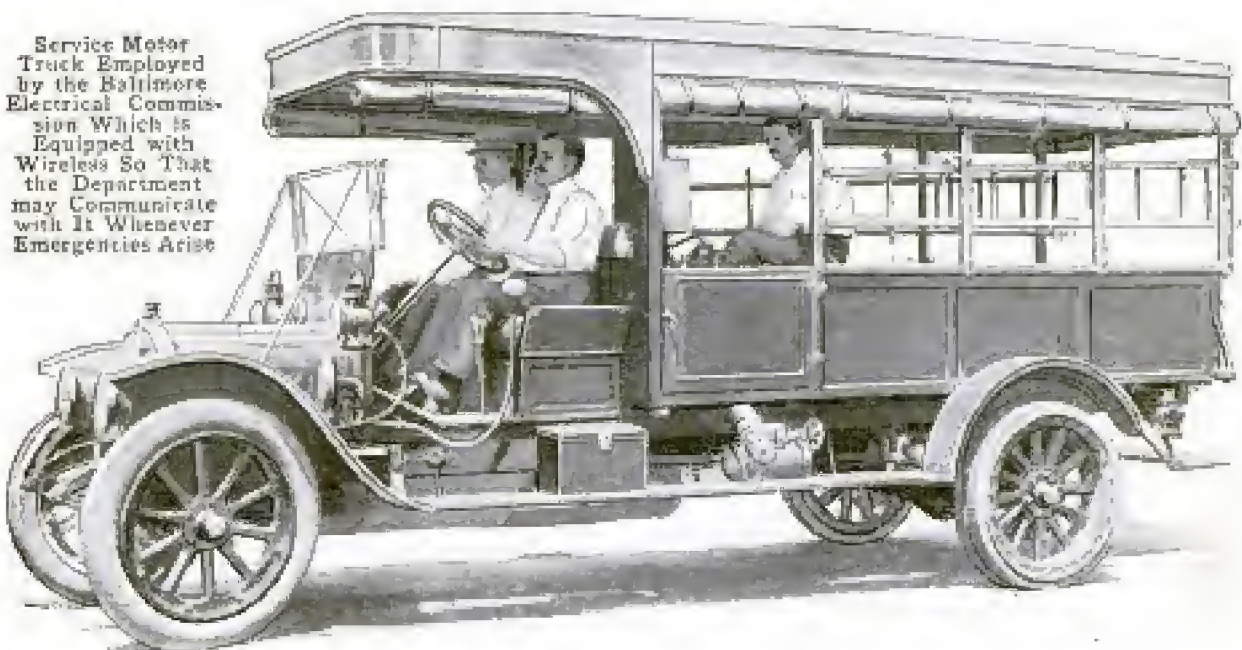
telegraph apparatus. Unlike most other portable radio outfits in general use, this is so arranged that messages may be received while the car is being driven at high speed through streets flanked by tall buildings of steel construction. At the same time the appearance of the machine is not such as to attract attention. The antenna, which is suspended beneath the roof of the truck, is composed of several hundred feet of copper wire laced back and forth so that it forms a net of about 40 parallel wires. No direct connection is made with the earth, since the metal chassis of the car serves as a counterpoise ground. With this equipment it is possible for the electrical commission to be in constant touch with the car over a radius of 10 miles and direct its crew to any part of the city when emergencies arise. Immediately back of the driver's seat is a suction pump, driven by a marine engine, which is capable of pumping 12,000 gal. of water an hour. In addition to this, there is an electric-lighting equipment which provides sufficient illumination for the inspection of man-holes and duct chambers. The machine, besides housing a compact, but complete, machine shop, and carrying considerable paraphernalia, has room for the transportation of a crew of several men.

PORTABLE ELECTRIC LAMP SERVES MANY PURPOSES

A portable electric lamp which has recently been devised is so designed that it may be employed in any one of many different capacities. It is provided with a substantial base which supports a flexible mounting for an incandescent globe and socket. Inside of this standard is an extension coil of wire cord which may be run out to the exact length desired by pressing a release button. A clamp, fitted on the bottom of the lamp, enables it to be attached in any position to an object, so that it may be used in a sick room; on a piano or a sewing machine; or be fastened to the top of a mirror for shaving; on the back of a chair for reading; or be used simply as a desk light. The shade is a convex disk supplied with wire clamps which grip over the globe and hold it at any angle. The lamp is less than a foot in height and may be carried conveniently in a suitcase or a traveling bag.



Service Motor
Truck Employed
by the Baltimore
Electrical Commis-
sion Which Is
Equipped with
Wireless So That
the Department
may Communicate
with It Whenever
Emergencies Arise

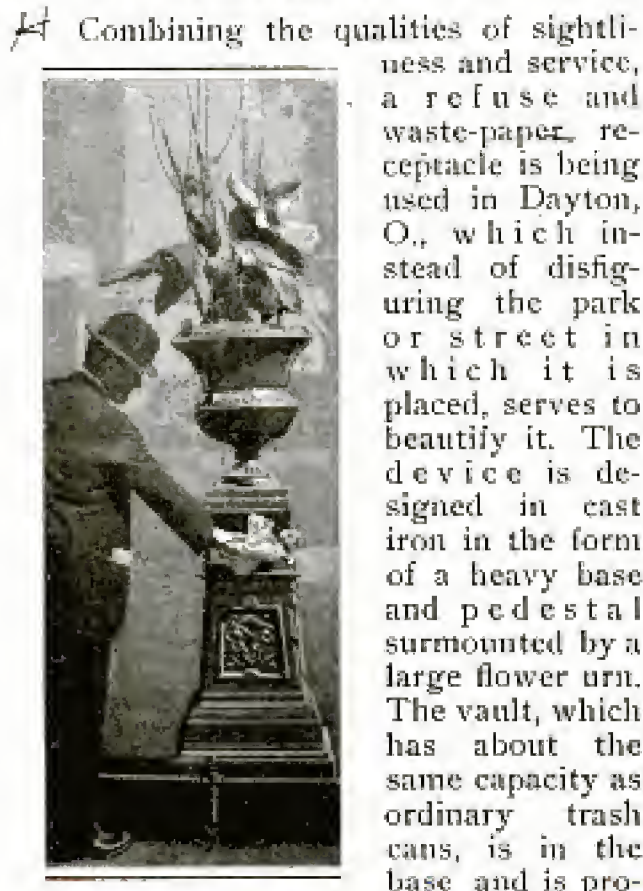


John A. Evans
 P. O. Box 598
 Asheville, N. C.
 432

POPULAR MECHANICS

PAPER AND TRASH RECEIVER OF ORNAMENTAL DESIGN

8624

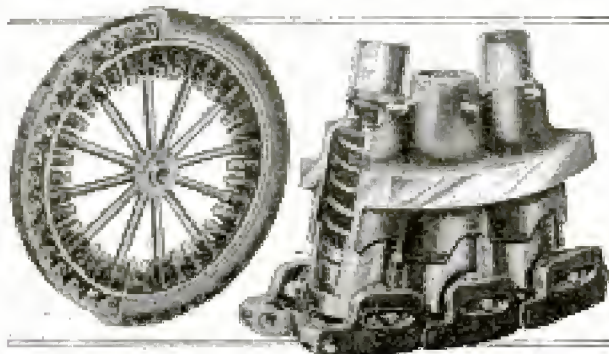


Combining the qualities of sightliness and service, a refuse and waste-paper receptacle is being used in Dayton, O., which instead of disfiguring the park or street in which it is placed, serves to beautify it. The device is designed in cast iron in the form of a heavy base and pedestal surmounted by a large flower urn. The vault, which has about the same capacity as ordinary trash cans, is in the base and is provided with a hinged door which remains closed when not in use. Refuse is easily removed from the receptacle.

AUTOMOBILE WHEEL WITH RESILIENT RIM

7107 m

An interesting feature in a new spring wheel for automobiles is a flexible metal rim that is designed to adjust itself in taking the weight of the car much after the fashion of a pneu-



In This Spring Wheel the Rim Consists of a Flexible-Metal Endless Chain That Adjusts Itself to the Weight after the Fashion of a Pneumatic Tire

matic tire. This rim consists of an endless chain of blocks, each block being pivotally carried on the end of a plunger that works in a cylinder, and is constantly pressed outward by a coil spring within the cylinder. The blocks are connected with each other and with the plungers in such a way that they can not only move inward against the action of the springs, but are free to rock and float slightly in the direction of the periphery of the wheel. As the wheel is ordinarily made, there are three blocks, with corresponding cylinders, to each spoke. The spokes are not directly connected to the springs, but have their ends fixed to the rigid framework of which the cylinders form a part. In this way all the resilient action takes place in the outer portion of the wheel, the spokes and hub forming a rigid construction. The rim is designed to be covered with a solid-rubber tire.

RAISING OF FUR BEARERS GOVERNMENT EXPERIMENT

Since silver-fox farming has proved a successful venture in Canada, the Department of Agriculture has commenced experiments in raising other fur-bearing animals in view of encouraging, if the idea is shown to be a feasible one, their propagation for commercial purposes. Experiment stations are being maintained at Prichard, Ida., and at the National Zoölogical Park, where study is now being made with minks and martens. The condition of the young minks which have already been raised has encouraged more extensive work, and during the present year it is intended to add raccoons, skunks, and possibly foxes to the animals included in the experiments. Investigation has shown that the moles, which are prolific in the eastern part of the country, have a superior quality of fur to those which have been imported in great numbers from Europe in recent years, and it is believed that the same is true of those found in the northwest.

Patented & Owner:
 Mrs. Lycurgue Anderson
 Lake Creek, Delta Co.,
 Texas.

Information sheet sent out
 by Dept. Agriculture

Keystone 11/15/14

Edmond H. Von Kaenel,
312 Wendell St.
307 Hill Chicago

USING ALUMINUM PENCILS 8929 IN GLASS ETCHING

It has been found by a Swiss chemist that designs, sketched on glass or porcelain with a pencil made of aluminum, will become etched on the material when treated with hydrochloric acid. Before the operation is attempted, however, it is necessary that every vestige of grease or oil be removed from the working surface by rubbing it thoroughly with chalk. In case a design is burnished instead of etched, it is said it bears a close resemblance to inlaid silver.

SAFETY ATTACHMENT FOR 7182 ROLLER SKATE

A simple device intended as a boon to roller skaters consists of a steel attachment with a rubber tip secured to the back of the skate and projecting downward to within $\frac{1}{8}$ in. of the floor or ground. This does not interfere in any way with the skating so long as the skate is flat on the surface, but the instant the skate tips backward the rubber tip comes in contact with the surface and acts as a brake. It is designed principally to prevent the skate from

flying out forward and throwing the skater, but is also useful in preventing



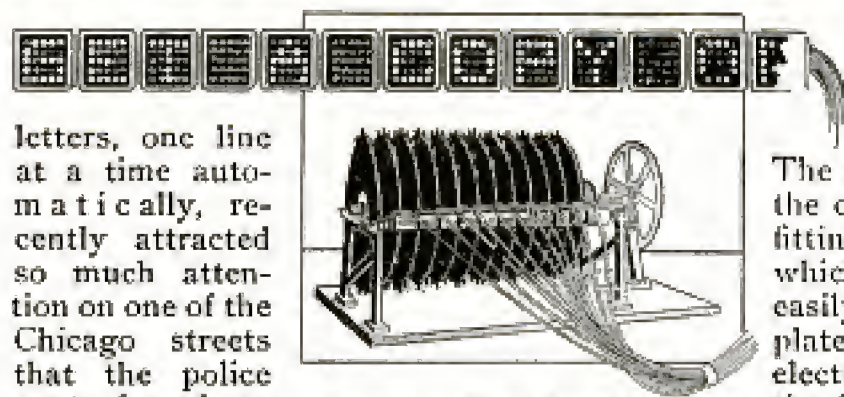
When the Roller Skate Tips Backward the Rubber Tip Comes in Contact with the Floor and Acts as a Brake

the floor from being damaged by the back part of the frame.

WINDOW GAZERS GIVEN TALK BY ELECTRIC SIGN

74/17 H
An electric window sign which prints a lengthy advertisement in illuminated

letters, one line at a time automatically, recently attracted so much attention on one of the Chicago streets that the police were forced to clear the crowds.



Electric Sign Which Shows 32 Changes of Matter before Repeating

The flasher which operates the sign and makes 32 changes of matter, con-

sists of a series of disk circuit breakers mounted on a common rotating shaft. Between each pair of disks is a contact arm containing 25 contacts, each connected with a separate set of wires.

The letter sticks project about the circumference of the disks, fitting into small grooves, which enable them to be set as easily as type. Each letter plate contains 25 individual electric lamps, which enable the formation of any letter on any plate. When the copy is set on the operating machine and the switch turned, the motor starts the

E. B. Electric Sign Co.,
209 N. Jefferson St.,
Chicago, Ills

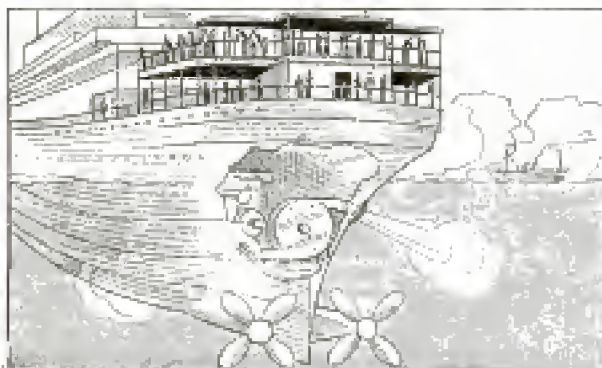
Illustrated Official Jour. of Patents
 English
 Invented by E. Whittaker, and S. W.
 Cooper, 434, Royal Exchange,
 Manchester, England.

POPULAR MECHANICS

rotation of the shaft and the sign begins its work. As soon as the 32 changes in matter have been made, the sign then repeats. Different copy may be run off daily. The sign is made in all sizes for both interior and exterior display. It also may be used as a train announcer or bulletin board.

APPARATUS FOR STEERING SHIP WITHOUT RUDDER

A curious ship-steering apparatus that has been patented in England eliminates the rudder and uses in its



With This Rudderless Steering Apparatus the Ship is Steered by Water Jets Directed to Starboard or Port as Required

place water jets that are directed to starboard or port as required. This apparatus is placed at the stern of the ship and well below the water line, and consists of a rotary pump with two horizontal pipes which lead off from the pump in opposite directions, each pipe serving either as feed or discharge pipe. When the ship is to be swung to starboard the pump is run so that water will be drawn in through the port pipe and discharged through the starboard pipe, while for swinging the ship to port the pump is reversed and the water is discharged in the opposite direction.

EFFECT OF EUROPE'S WAR ON AMERICAN LEATHER

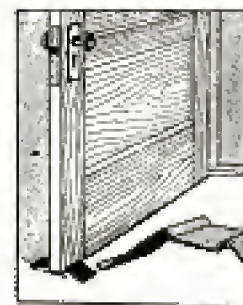
Before the outbreak of the European war certain American manufacturers strongly advocated cloth tops for shoes because of the shortage of suitable leather. Since that time the situation has steadily grown more perplexing.

Agents for foreign governments have literally scoured the country for hides, and the result has been that the prices of some grades of leather have greatly increased, while others have doubled.

The effect of this has been to turn attention to artificial leathers and other substitutes. "Split leather," which rightfully comes under this classification, has been in general use during recent years, especially in the upholstering industry. Its appearance is so nearly like that of the genuine product that, when it is made up, it is often difficult for the layman to detect the difference between it and real grain leather. In making it, the lower portion of the hides are cut into two or three sheets which are first coated with a special treating solution and then embossed to give a characteristic grain. It is asserted that two-thirds of leather upholstery is made of this material. The growing demand for substitutes has caused the development of purely artificial leathers which in appearance also bear a close resemblance to leather, and in some cases have good wearing qualities for certain uses.

NOVEL HOLDER KEEPS DOOR IN PLACE

During the months when doors are kept open a good deal, some contrivance is necessary to keep them from blowing shut, and a little device for this purpose has just been put on the market. It consists of a thin plate of spring steel, curved to catch and hold the bottom edge of the door, with screw holes for



fastening to the floor at any point desired. When the door swings open it forces the clip down, gliding over it until the groove in the clip catches the bottom, holding the door fast. A pull on the door depresses the spring, and the door is released.

Mfgs: The Specialty Mfg. Co.,
 Westboro, Mass.

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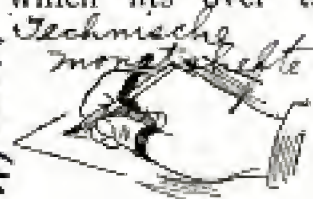
4 THIN STEEL RIBBONS USED 8932 FOR DRIVING BELTS

Especially hardened charcoal steel of a thickness not greater than $\frac{1}{16}$ in. is being used in making metal transmission belts. The steel used for this purpose is prepared by a secret process and is credited with having a tensile strength of approximately 95 tons to the square inch. The belts of this kind now in use vary in width from $1\frac{1}{2}$ to 8 in. The two ends are connected in such a manner that the joint does not interfere with transmission, while the circumferences of the pulleys are covered with a thickness of canvas over which thin sheets of cork are glued.

A GERMAN WOMAN PATENTS

6695 A PENHOLDER GUIDE

To insure a correct position of the fingers and pen in writing, a guide which fits over the forefinger and thumb of the right hand has been invented and patented by a German woman. It is composed of metal clips and hooks so arranged that when the penholder is inserted it maintains the correct angle with respect to the hand. The device tends to prevent excessive bending of both forefinger and thumb, without interfering with such limited flexibility as may be needed for easy writing.



FUEL COMBUSTION AIDED

7922 BY SIMPLE DEVICE

Intended to reduce fuel consumption and increase the heating efficiency of stoves and furnaces of various types, a device which assists combustion has been invented, submitted to tests by the government and adopted for use in both the army and navy. By applying it to a heating apparatus consuming either coal or wood, the escape of gas is prevented, clinkers are eliminated, and the wear on the grates less-

ened, it is claimed. The appliance consists of a hollow casting, and in the case of the one built for use with a



A Device Which Lowers Coal Consumption and Increases Its Heating Efficiency

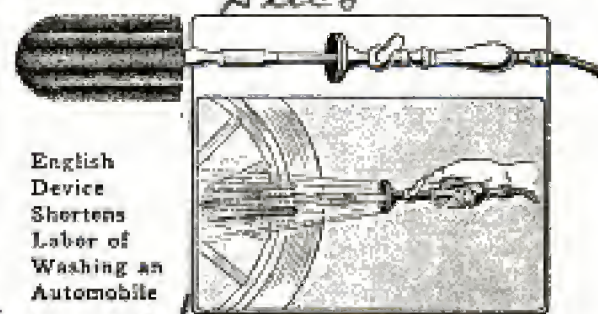


range, is fitted on one side with a $\frac{3}{4}$ -in. nipple. This is inserted in a hole bored in the top sheet of an oven, and allows the air from that compartment to flow into the inner passages of the casting and finally through teethlike outlets into the firebox. As this heated air comes in contact with the fire it furnishes a fresh supply of oxygen which provides for the complete combustion of the inflammable gases that otherwise would escape.

NOVEL CAR WASHER FOR

6994 W GARAGE

The labor of washing an automobile is considerably reduced by a device put on the market by an English concern, combining a rose spray from a hose with a brush. The pressure of the water is regulated by means of a thumb lever on the nozzle of the hose. In application, the mud is first softened and loosened by the water, without using the brush, which is brought into play later, the flow of water being



English Device Shortens Labor of Washing an Automobile

then directed on the brush while the paint work of the car is being gone over carefully with the brush.

The Light Car & Cyclecar

Sold by: Brown Bros. & Co.
Great Eastern St.,
New York, N.Y.

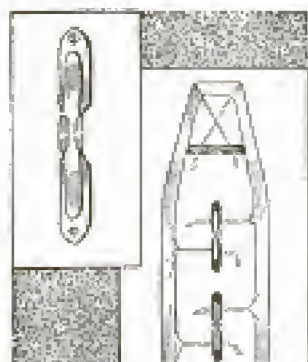
Inventor: Helen Mayer Höcher a/m, Ber.

Francy, Shore & Co.
180 Broadway, N.Y.C.

price 17/6

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NOVEL AND PRACTICAL THINGS FOR DAILY USE



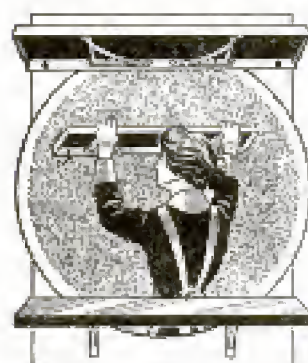
Convenient Ironing-Board Cover

COVERS for ironing boards are being made which may be detached and washed without trouble or unnecessary work whenever it is desired. Sewed to both sides of the cloth are substantial straps which are gripped tightly by especially designed clamps, attached to the under side of the board.



Serving Cup Keeps Egg Hot

A serving cup for soft-boiled eggs that keeps its contents hot for 15 minutes after it is placed on a table, may be obtained in German silver, nickel, or copper. About a tablespoonful of hot water is placed in the metal holder before the glass cup is inserted. This fills the space between the two walls and keeps the egg heated.



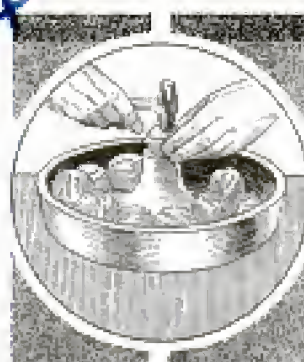
Easily Attached Metal Shelf

ENAMELED metal shelves which may be attached to a wall in a moment's time whenever needed, without requiring any carpenter work, are being manufactured. They are neatly finished and appear more sightly in a toilet room, or an office, than do most wooden shelves unless they are well made.

In the center of an artistic bowl is a steel anvil upon which to crack nut shells. The dish is made of polished hardwood, while the anvil, as well as

the small hammer which accompanies it, is plated in silver or gun metal.

A convenient utensil, which is among the lately devised kitchen accessories,

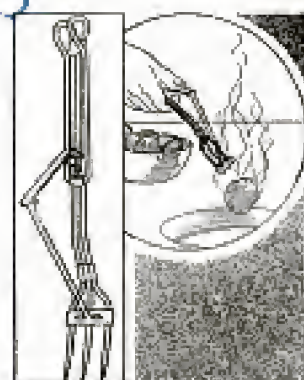


Nut Bowl with Anvil and Hammer

is a long wire fork intended for handling hot meats or vegetables. It is provided with a jointed arm fitted with a sliding foot, which, when pushed forward by the thumb or forefinger, quickly removes any-

thing caught on the prongs.

Patent rights are being asked on a

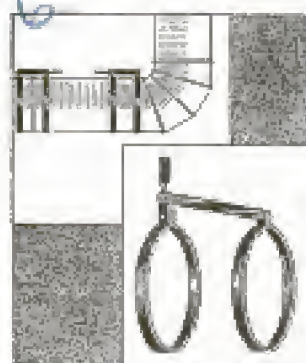


Serviceable Fork for Kitchen

simple stovepipe brace which holds the sections of a pipe together rigidly without requiring them to be wired to the walls or ceiling of a room. The device consists of two metal hoops joined by a bar to which a

thumbscrew is attached. The bands are tightened about the pipe on each side of the joints by adjusting two screws and throwing the lever into a horizontal position.

An adjustable ring which may readily be made to fit a finger of any size and easily passes over enlarged joints, has re-

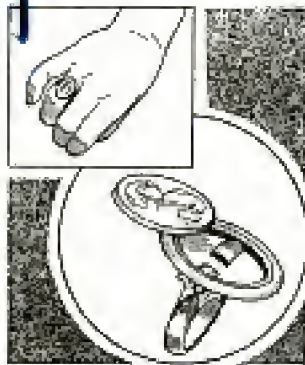


Simple Stovepipe Brace

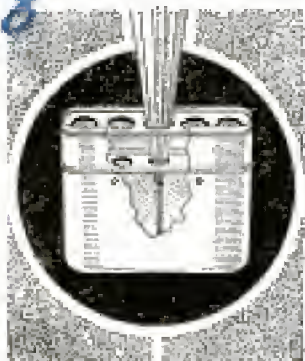
cently been invented. A spring wire, forming the shank of the ring, has one end free so that its circumference is expanded or contracted in the process of placing it on the finger.

An inexpensive and compact umbrella holder, which may be used either indoors or outside, is being made of sheet metal. It is designed to be screwed to a baseboard at an angle which prevents wet umbrellas from soiling a wall, while the water which drains into it may be removed by taking out a stopper in the bottom. The device has places for five umbrellas and is only 8 by 7 by 2 in. in size.

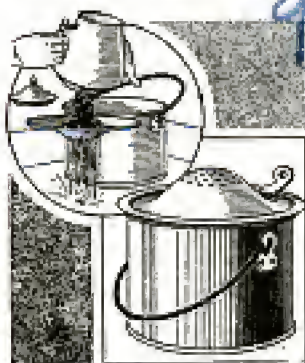
Application for a patent has been made on a garbage pail fitted with a perforated cover which separates water from solids and prevents the drain pipes of a sink from being clogged with coffee grounds, or other waste matter. The cover, which is



Adjustable Ring Fits Any Finger



Compact Metal Umbrella Holder



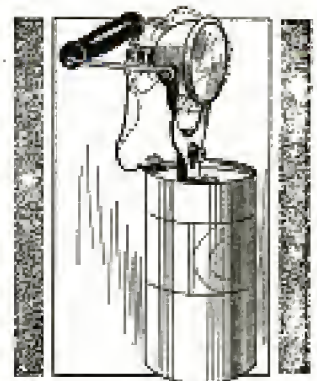
Garbage Pail with Strainer

with an ordinary dry cell is supported by a bracket which is intended to be

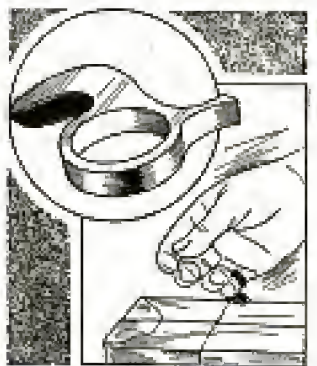
screwed to the positive post of the battery. A wire extends from the negative pole to the socket, holding a small tungsten bulb. The device is provided with a handle and bail so that it may be used as a lantern.

A ring supplied with a scoop-shaped knife with which to cut heavy cord, is intended for the use of bundle wrappers. It is worn on the little finger of the right hand, in such a position that a quick snap of the wrist will sever a piece of twine after a knot has been tied. Extending from the band on the side opposite the knife, is a small lug which rests in front of the third finger, thus preventing the ring from turning when the blade is used.

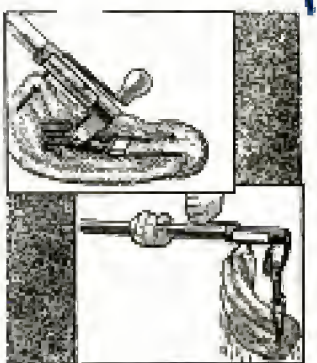
Designed particularly for household use, a mop is being made which, besides presenting a flat working surface, is provided with a wringing device that makes it unnecessary, when cleaning a floor, to wet the hands with scrub water. The end of the cloth, which in most mops is ordinarily free, is in this instance held by a wire device that is turned by a handle. The cloth may be twisted tightly and the water wrung from it more quickly than by the customary method.



Lamp Used with Ordinary Dry Cell



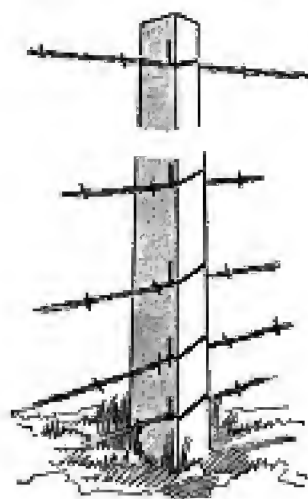
Knife for Cutting Heavy Twine



Mop with Wringing Device

6782 **CONCRETE FENCE POST WITH NEW WIRE FASTENING**

One of the greatest troubles in connection with concrete fence posts has heretofore been in providing an efficient and economical fastening for the wire. This is apparently overcome by a new reinforced-concrete post that has just made its appearance on the market. For holding each wire in place this post has a slot shaped like a narrow vertical cut running through the post from side to side, while a diagonal slot connects this with the adjacent face of the post. The wire is inserted through the diagonal slot, and when drawn taut it is held securely in place, as it is out of line with the diagonal slot.



7423 **"COOKIE GUN" USES DOUGH FOR AMMUNITION**

Frequently Norwegian housewives coming to this country bring with them what is known there as a cookie gun.



Cookie Gun Such as is Commonly Used by Norwegian Housewives

It is a cast-iron instrument similar to the ordinary grease gun employed in oiling heavy machinery. By removing the top and taking out the screw plunger, cookie dough may be put into the tube. It is then forced out through the narrow nozzle into a long tapelike strip. This is cut into

small pieces which are looped, and their ends then pressed together so that the circular piece of dough will keep its shape while being baked.

7263 **NEW SPRING CASING FOR FLEXIBLE SHAFTS**

A casing for flexible shafts recently placed on the market is so made that it will bend readily without taking a set and will fly back to a straight line the instant the bending force is removed. This is accomplished by an ingenious arrangement of two spiral wires, one working within the other and each provided with wedge-shaped edges so that the two spirals nest closely together. When the casing is bent to a curve the outer segments of the outer spiral are forced apart by the wedge action of the inner spiral, while the inner segments of the inner spiral are forced apart by a similar action of



This New Flexible-Shaft Casing Bends Readily, but Flies Back to a Straight Line the Instant the Bending Force is Removed

the outer spiral, and it is this, combined with the ordinary spring action of the two spirals, that gives the casing its strong tendency to resume a straight position when the bending force is removed. To prevent wear on the shaft, the inner face of the casing is made flat.

899 **DREADNAUGHT "CALIFORNIA" TO HAVE ELECTRIC DRIVE**

Electric propulsion has proved so successful in the operation of the recently built collier "Jupiter" that the Navy Department has ordered the new dreadnaught "California," described in a previous issue of this magazine, to be similarly equipped. This will be the first electrically driven battleship ever constructed for any navy. By placing a dynamo and motor between each steam turbine and propeller shaft, it is possible to maintain the engines continuously at their most ef-

J. Crosby McCarthy
Evening Star,

Washington, D.C.

14-8-18
All Spec. 14-8-18
Dis. Am. 14-6-13

Francis P. Mann
12 Boulevard Arago,
Paris, France

POPULAR MECHANICS

439

efficient and economical speed. On the other hand, by driving the propellers electrically, greater flexibility and more rapid and accurate control is provided. The new vessel is to be built with the money received from the sale of the battleships "Idaho" and "Mississippi" to the Greek government.

LETTER AND ENVELOPE IN ONE PIECE

A clever French inventor has brought out a brand new envelope by resurrecting an idea in vogue when the post chaise traversed Europe, and combining with it the modern transparent patch seen on many business letters, whereby the address, written on the letter, does not have to be repeated on the envelope. The French device consists of a sheet of writing paper with two gummed flaps, and the transparent patch referred to. Upon writing the communication and folding the letter twice, the missive becomes an addressed envelope, needing only the adhesive action of the gummed edges and a proper postage stamp. Another advantage is the fact that the cancellation stamp of the post office, giving the date, is affixed to the letter itself, thus avoiding a common source of dispute which the ordinary system of correspondence



Folding Letter Sheet Which Records Date of Mailing

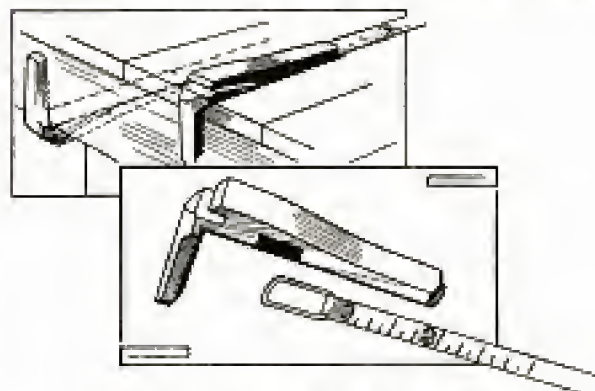
is subject to, by reason of throwing away the envelopes upon opening letters.

A new device working on the principle of the Maxim gun silencer is designed to do away with the noise of steam safety valves and of boiler blow-off valves.

Ingrs: The Kuffner & Co.,
Saginaw, Mich

TERMINAL HOOK FOR USE WITH STEEL TAPE

The convenience of the flexible steel tape has brought it into common use in building and construction lines,



This Hook Attached to a Steel Tape Takes the Place of an Assistant for Holding One of the Ends

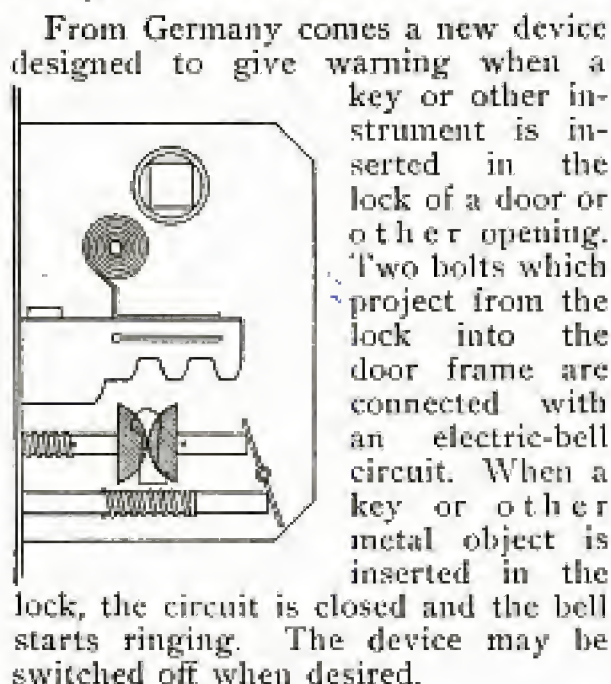
but there is an obvious disadvantage in that long measurements require the driving of a nail or the assistance of a second person to hold the end of the tape in position. A device which remedies this consists of a small hook with a toothed under side, and a slotted passage for the introduction of the steel tape, which is held firmly by a spring. With this hook in use the end of the tape may be held without assistance and accurate measurements made, as the hook is so constructed that measurements begin from its under surface. The hook may be adjusted on the tape in a moment or removed quickly by the pressure of the spring.

LONG BREAKWATER IS PROPOSED FOR PANAMA CANAL

It is proposed to construct a 7,000-ft. breakwater running southwest from Margarita Island, at the east entrance to Panama Canal, in order that vessels may be afforded protection from the trade winds during the dry season without being compelled to enter the canal. This bulkhead, which it is estimated will cost about \$3,000,000, if ordered by Congress, will provide a place where ships may be coaled, and along which barges and small boats can tie up safely.

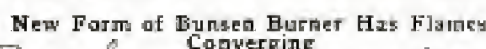
Christian Science Monitor

FROM SAN DIEGO TO ALASKA
OVER GOOD ROADS



7040 W IS LATEST TYPE

A powerful heating flame is given by the latest type of Bunsen burner in which the flames converge into one, by means of several jets arranged in circular, semicircular or conical form. The principle is identical with the ordinary Bunsen burner, in which gas is mixed before ignition with suitable quantities of air, producing a bluish flame of great intensity, but certain objectionable



qualities of the single jet are overcome by the use of the radial burner which is noiseless, steady, and has no "cool center."

It is costing the British government approximately \$5,000,000 a day to participate in the European war.

In the Pacific coast states and extending over the Northwest through British Columbia, as well as provinces to the east, into Alaska, there has been a pronounced movement for better roads, the effect of which is noticeably resulting in much construction work. Before the close of 1915 the Pacific coast highway, planned to extend from southern California, via Vancouver, to some point in Alaska, is expected to be completed from San Diego to British Columbia, enabling motorists to make the entire trip on hard-surfaced drives. This route, besides touching the principal cities and extending over some of the most attractive districts in the region west of the Rockies, will also connect with the transcontinental Canadian highway which is now being built.

The original trails through the western provinces of Canada for the most part lie east and west, which is also true of the railroads. Attention is now being given particularly to the establishment of coastwise routes to connect with these arteries, many of which extend to the central and eastern provinces. The progress which has been made in British Columbia in this respect has been considerable. Every section which is settled is building roads, and in 1913 the amount expended for this work reached approximately \$7,000,000.

Strides in a similar direction are reported as being made in the Yukon country. Between Dawson and Whitehorse grades are being cut and dangerous turns eliminated, together with considerable filling and resurfacing. It is intended to construct a system of roads connecting with those through British Columbia, which will complete the northern part of the coast highway. The survey for the proposed government road to the summit of White Pass, connecting with the Canadian routes to the Atlin section, has been completed, and maps are now being prepared.



Difficult Weld by the Chemical Process

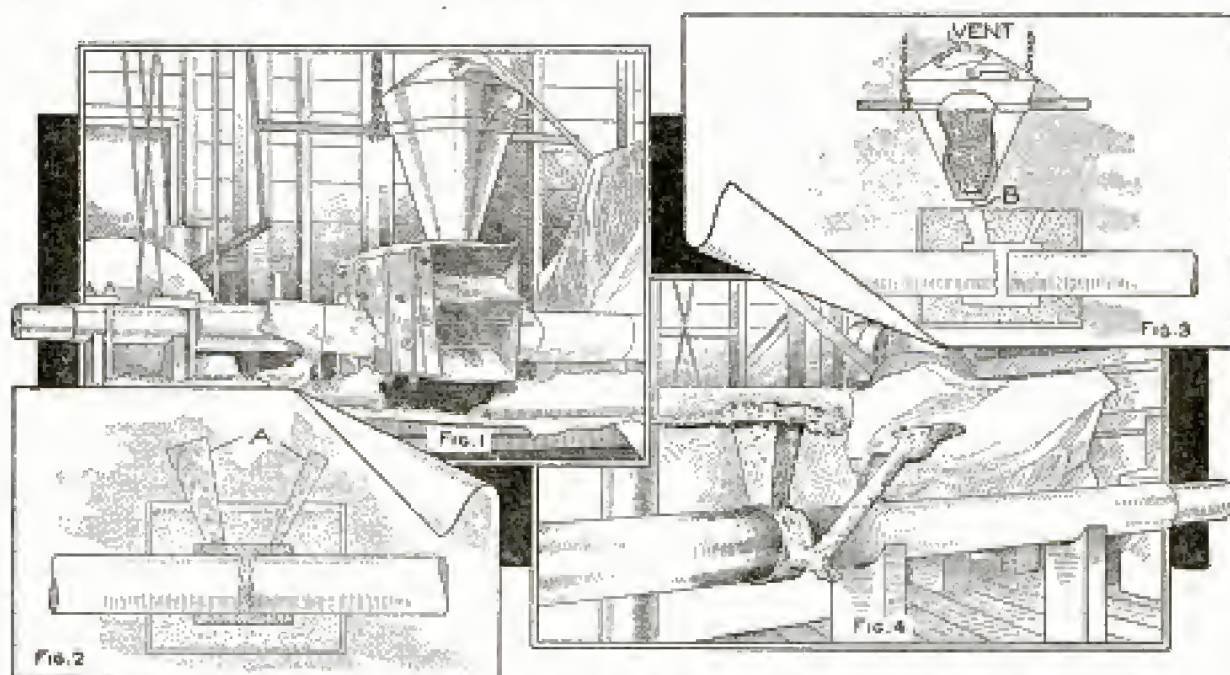
By F. W. BENTLEY, JR.

THE efficiency of chemical welding as a restorer of broken machinery parts has long been widely recognized and put into practice. The use of it in repairing heavy casting parts, where the necessity of extreme accuracy is not a paramount factor, makes the process to some extent a simple one. However, in a great many instances where such welding is attempted the operation calls for considerable skill and knowledge of the many points which go to make the work a success.

Shafting and other journal pieces of moderate diameter present a phase of welding that is covered to some extent with varying results. The illustrations represent a piece of work successfully executed in a small railway shop. The shaft was from an alternating-current generator, belonging to a plant on the

railway line at some distance from the railway shop. The shaft was 14 ft. 8 in. long, and 8½ in. in diameter at the largest part. The break occurred about 4 in. from a fillet on the larger portion of the shaft. It was successfully repaired at a safe margin of cost under one-fifth the price of a new one. The operation of welding covered a period of less than one day, and when placed in the lathe for trial, the shaft did not run out of alinement more than ¼ in.

To those not familiar with the process, a brief description of the operation may be of interest. A number of large V-blocks are shaped from a block of iron bars bolted together on the bed of a slotter. The V-blocks, each of exactly the same size, are then stood up on the bed of a large planer,



The Mold as It is Built Up around the Broken Ends of the Shaft, the Crucible with the Welding Compound Suspended over It, and the Weld after Removing the Mold

and the shaft pieces laid horizontally in them, as shown in Fig. 1. The shafting is then lined up, the faces of the break being set about 1 in. apart. Softened paraffin is next placed, shaped, and filled in around the broken ends of the shaft, as shown in Fig. 2. This forms the body mold of the welding mass. The sand, or mold, box is then built in sections and bolted around the shaft, and the sand pounded firmly around the paraffin filling over the break. Through the sand and touching the paraffin extend two triangular, or circular, pieces of wood, A, which make the pouring opening, or gate, and overflow, or vent, in the mold. A gasoline blowtorch is then applied to the mold and the whole arrangement heated, causing the paraffin to run out through a small hole made for it in the bottom of the mold. This hole is plugged with sand when all the paraffin has run out. The application of the torch is continued until the ends of the shaft are heated to almost a melting point. This leaves a coring space to be filled by the welding com-

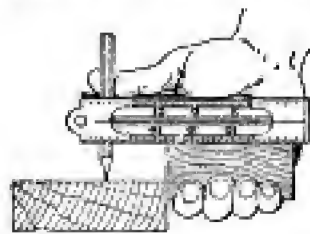
pound when it is allowed to run from the crucible into the sand, or pattern, boxes.

The funnel-shaped arrangement over the sand box, or mold, holds the powderlike chemical, freely mixed with small special-steel billets. The funnel is nothing more than a special crucible, made of sheet metal and lined with fire clay. This is shown in section in Fig. 3. When the combination is lighted, the burning of the thermit, or welding, compound melts the steel, which at the right moment is let down into the mold through the hole B. This hole is stoppered the same as a cupola. The shape of the welding mass, after removing the mold, is shown in Fig. 4. The protruding parts are then drilled and cut off, leaving the weld complete.

The chemical compound most commonly and successfully used is known as the thermit welding compound, a mixture the nature of which is but little known, but the oxidization caused by it heats the crucible of welding steel in from 10 to 15 seconds.

Folding Rule Used as Marking Gauge

An ordinary 2-ft. folding rule and a lead pencil can be readily used in place of a regular marking gauge.



Place the pencil between the folds of the rule so its short wire pins will be forced into the wood of the pencil, firmly holding it in position. With the aid of a small block pressed tight against the bottom of the rule and held against the board to be marked, any desired gauge line may be drawn. The block may be omitted if no fear is felt of running splinters into the hand, in which case the gauging must be done with the forefinger of the hand sliding along the board, the thumb resting on top of the rule as before.—Contributed by Abner B. Shaw.

A Painter's Air Brush

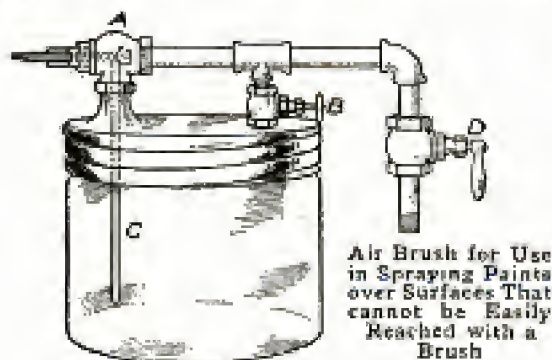
J. N. X1106) 2448

In painting complicated machinery, or irregular surfaces, spraying may often be resorted to, which will result in covering every part neatly, and in considerably less time than required to do it with a hand brush. To make the illustrated air brush, or spraying device, a glass jar should be obtained, having a metal screw top. In this cover, two holes should be made as far apart as possible; one, for connecting with the angle valve A, and the other with an air-pressure regulating needle valve, B. The handwheel and stem of the valve A should be removed. From the inner, or valve, end of the stem, a $\frac{1}{8}$ -in. hole should be drilled lengthwise through the center to within $\frac{1}{4}$ in. of the outer end. If the stem is longer than convenient, part of its outer end may be cut off, but the precaution should still be observed not to drill all the way through with the $\frac{1}{8}$ -in. size.

An outlet is provided by a $\frac{1}{16}$ -in. hole continued through the undrilled $\frac{1}{4}$ -in. section. In order to make a connection between the drilled stem and the contents of the glass jar, a piece of copper tubing, C,—such as is used on gas-engine carburetors—should be threaded at one end to fit a drilled and tapped hole in the hollow valve stem, so that, when the valve is in position on the jar and the stem tightly fitted to its seat, the tube can pass into the jar and reach to within $\frac{3}{4}$ in. of the bottom.

With the spraying head finished, the necessary piping can be cut and fitted, connecting the regulating valve B and stop valve D with the head A. It is necessary to have all joints tight, and the valves A and B so spaced that they will fit the holes made for them in the cover. A nipple fitted with a hose coupling must be attached to the stop valve to connect it with the air-pressure tank. All the necessary piping being completed, the screw cover should be soldered to the valves A and B. With the jar filled with paint, the cover may be screwed on and the sprayer is ready for operation.

The air necessary for spraying may be supplied by a small tank and hand pump, capable of furnishing a pressure up to about 15 lb., depending on the kind of paint to be sprayed. In operating the sprayer, the valve D is first



turned open. The pressure inside the jar, regulating the flow of paint, is adjusted by the needle valve B.—Contributed by A. H. Waychoff, Koenig, Col.

¶ Cover the exposed parts of a damp clay runner with oil—preferably kerosene—before pouring in melted babbitt.

Umbrella Equipped with Celluloid Window

If a piece of about 2 by 6-in. transparent celluloid, such as is used on



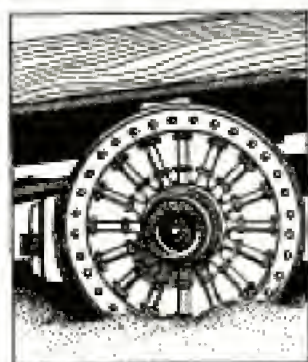
automobile tops, be sewed over a prepared opening in an umbrella, the difficulty of looking ahead in a driving rain can be overcome, without the necessity of raising the umbrella and thereby running the risk of getting wet, or having the umbrella turned inside out.—Contributed by H. W. Hahn, Chicago, Ill.

Solid Object in a Barrel Kept Away from Opening

A bung, plug, or cork pushed into a barrel will cause trouble when tapping until the entire contents are removed. It will push its way into the outlet as the liquid flows and obstruct the opening. An excellent way to keep the trouble maker away from the opening is to drive four small nails in the end of the faucet around the hole before inserting it in the barrel bung. The nails are only driven in far enough to hold, allowing most of their lengths to project. The nails will keep away any floating object from the opening.—Contributed by A. H. Woodyard, Ada, Oklahoma.

Reducing Traction Power by Filling Space between Wagon-Wheel Spokes

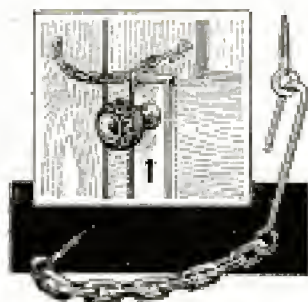
Considerable power can be saved, when pulling a heavy load, by filling in the space between the spokes of the wheels on a wagon or truck, as illustrated. This method was devised by a driver after observing how the sand would fill in between the spokes, and be lifted almost level with the



hub as the wheels revolved, before it spilled out. The added weight of the sand was considerable, and a load on the wagon formerly requiring six horses, could be easily pulled with four horses after the spaces had been filled.

Safety Chain for a Door

Timid women frequently dread to open a door if they suspect that strangers are on the outside. Security can be assured if the door is provided with a chain and hook as shown in the illustration. It is necessary to have two strong

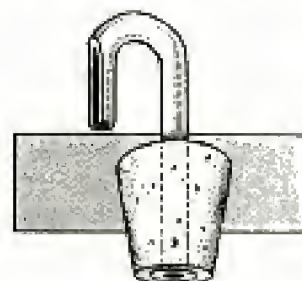


screw eyes, 6 or 8 in. of strong chain, and a hook with a loop 3 or 4 in. long. One of the screw eyes is opened up sufficiently to allow an end link of the chain to enter, after which it is again closed up tight. The long hook should be attached to the other end of the chain in the same manner. The screw eye, with the chain attached to it, should be screwed into a convenient place in the door casing a little above the door knob. The second screw eye should be so placed in the door that it would be necessary to have this nearly closed before the hook could be put on or taken off the

screw eye. This precaution will prevent the possibility of an intruder unhooking the chain from the outside. When in position, the chain will allow the door to be opened merely sufficient to see the stranger or carry on a conversation; it would be impossible for anyone to enter.—Contributed by L. R. Buzzell, Malden, Mass.

A Pocket Bath Spray

The pocket bath spray consists of a nickelplated copper tube bent in the shape of a fishhook with a $\frac{1}{2}$ -in. opening or slit in the

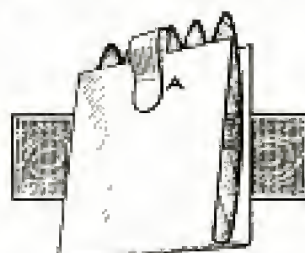


curved end, the body being flattened out so as to produce the spray when the water is forced through it. The other end of the tube is inserted

through the center of a cork, cut tapering to fit various-sized faucets, and has a round plate soldered to the upper end to prevent it from slipping through the cork. The attachment can be carried in the vest pocket and is instantly fitted to any bathtub or lavatory faucet, or it can be used outdoors on a hydrant for removing the salt water after a dip in the ocean.—Contributed by D. S. Rockwell, Ocean Beach, Cal.

Metal Lining for Clothes Pocket

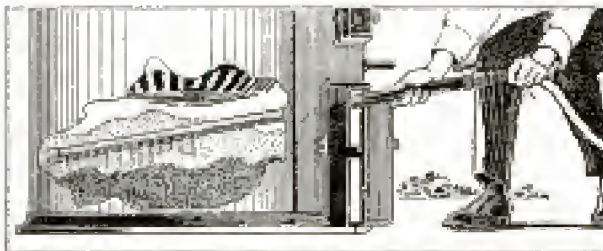
To safely carry articles in a pocket where they would be easily broken or crushed, metal linings can be provided. For this purpose a very thin, hard sheet brass is used. A strip is cut having a width equal to that of the pocket, and a length corresponding to twice the depth, with an additional amount of approximately $\frac{3}{8}$ in. to form the bottom of the pocket and a



small strip, $\frac{1}{4}$ in. wide by $\frac{3}{8}$ in. long, at the center of one end for securing the lining in place. The metal is folded, as shown, to form a pocket, the top having a tendency to spring shut. The extra lap A, on the one end, is bent over the outer side of the pocket, securely clamping the lining in place. —Contributed by J. E. Noble, West Toronto, Ont.

To Prevent Dust When Removing Ashes from Furnaces

In removing ashes from furnaces, there is always a considerable amount of dust created that makes the task disagreeable, besides covering everything near by. One resident eliminated the dust with a homemade device, as illustrated. A piece of pipe was procured that would reach to the rear part of the ash pit in the furnace and project far enough to make a handhold. The pipe was capped on one end and fitted with a hose connection on the other end. The part that extends into



A Pipe with Numerous Holes is Fastened to a Hose for Wetting Ashes to Prevent Dust

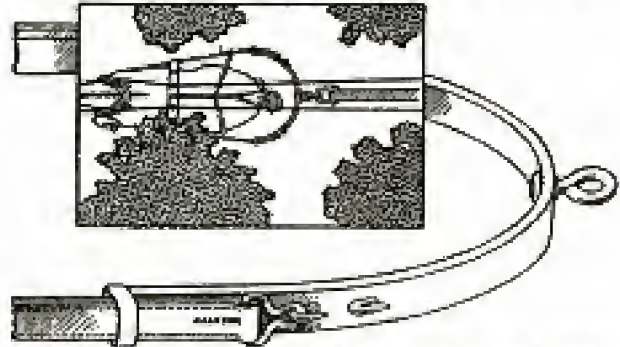
the pit was drilled to make a number of small holes evenly spaced throughout its length. The pipe was then connected to a hose running from the laundry tubs.

In removing the ashes, the pipe is connected up and run into the ash pit, the water turned on, and by swinging the pipe about, the ashes are well wetted down so that in removing them no dust will be raised.

ⒸA 2-in. paperhanger's roller, covered with soft plush and inked on glass in the same manner as a printer's roller, makes an excellent device for inking over stencils.

A Singletree for Use in an Orchard

In getting in around apple trees in an orchard with a cart drawn by a horse, many trees are skinned by the

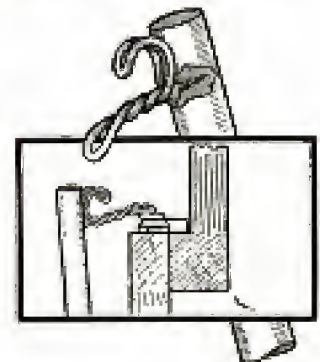


The Rounding Ends of the Singletree do Not Present Any Projection That will Bark a Tree

ends of the singletree. Sometimes a bunch of rags tied on the ends will prevent the skinning, but a much better way is to have a special singletree made in a semicircle, as shown. It can be bent to shape from a piece of heavy tire iron, a leather loop being attached to each end for passing the traces through, and hooks to engage the traces riveted on. The location of the hooks should be far enough back so that they will not be exposed. No part of the singletree, nor the hooks, will then touch a tree, and the leather traces will slip past easily.

Pole to Loosen Window Catches

The height of some window sash brings the catch out of reach, and to open a window means to climb a chair and loosen the catch. To overcome this difficulty, I made a device as follows: A stick, long enough to reach the catch, was procured, and a coat hook attached close to one end. In use, put the hook on the catch and push up or pull down, and, for catches that turn sideways, give the stick a twist. —Contributed by Maurice Baudier, New Orleans, La.



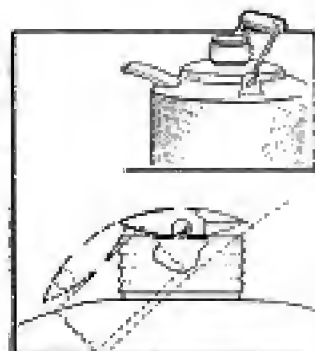
Coat and Hat Hanger for Shops

In many shops coats and hats are frequently hung up on pegs fastened to boards, which are provided with holes at the upper end to suspend them from nails in the walls. It often occurs that the hat drops off, into the dust or dirt, causing much annoyance. If the board is equipped with a spring, as shown in the sketch, the hat will be securely clamped in place, and cannot fall off accidentally. To avoid the fishing necessary in placing the board on a nail, a tapering slot can be cut into the board with its point above the opening. The nail is easily caught anywhere within the wide opening, and will guide the board to the narrow end of the slot, supporting it in the usual way.—Contributed by John J. Kolar, Maywood, Ill.



Gasoline Can with Combination Whistle and Vent

Even though gasoline cans are distinctively colored, usually being painted red, dangerous mistakes are very apt to occur if the can happens to be in a dark place, or otherwise so situated that its contents are not readily detected. A better safety device is to provide a whistle which automatically blows every time the can is tipped.



To make this device, a small oval whistle is required which will fit within the screw cap of the can. Inside of the whistle is placed a steel ball, sufficiently large to cover the

whistle hole, but free to roll around inside when the can is tilted. A hole is made in the screw cap and the whistle, on the inside, so that the hole in the cap will line up with the one in the whistle.

When the can is tilted for pouring out oil, the ball will roll away from the hole, allowing air to pass through which will serve two purposes; it will blow the whistle, thereby giving an alarm which will probably result in an examination as to the contents of the can; and it will also act as a vent, enabling a freer flow of oil from the can.—Contributed by W. C. Loy, Rochester, Ind.

To Stop Noise of a Valve Push Rod

A common fault of a gasoline engine is its noisy operation when the valve is lifted. This is usually caused by the steel-to-steel contact of the valve stem proper and the lifter-adjusting screw A. Bore a hole, $\frac{3}{8}$ in. in diameter, in the screw to a depth of about $\frac{5}{8}$ in., countersinking it slightly, as shown. A piece of hard-fiber rod, $\frac{3}{8}$ in. in diameter and approximately $\frac{1}{2}$ in. in length, is pressed securely into the hole and hammered down until the countersunk portion is completely filled. The extending portion of the fiber is filed flush with the top surface of the screw. All the screws are fixed in a like manner. This will make an engine almost noiseless.



Starting Motorcycle Engine in Cold Weather

In starting a cold motorcycle engine, close the air shutter on the main jet, and then, by quickly opening and shutting the throttle while cranking, the motor will draw a rich mixture and start quite easily. The auxiliary jet will usually pick it up, and the air shutter can be again adjusted where it runs best.—Contributed by F. L. Prescott, Starke, Fla.

To Locate and Correct Troubles in Direct-Current Dynamos

By A. E. ANDREWS

PART I—Sparking at the Brushes

IT is the purpose of this article to present the methods of locating and correcting the troubles that may occur in generators and motors at any time while they are in service. While the description may not be complete in every detail, it will cover a large percentage of all the cases of trouble that may arise, and will thus serve as a useful guide to those in charge of machinery. In the majority of cases the trouble is very easily remedied after its cause is once found, but the greatest difficulty is to recognize the cause, and for this reason a greater stress will be laid upon a method to determine the cause. It is always best to try to locate the cause with as little interference to the service of the machine as possible. Proper care should be exercised at all times not to expose oneself unduly to electric shock, or contact with bare conductors. With the exception of one or two cases, the following description deals with what are termed low-voltage machines, and nothing above 250 volts. Extra care should be taken in working around machines of higher voltage, as the danger is much greater. In making the simple tests that are suggested, it is assumed that the operator has the use of a voltmeter and an ammeter.

Fault of the Brushes

The one main cause for sparking at the brushes is that they are not set diametrically opposite. The setting of the brushes should be done while the dynamo is at rest, by counting the bars, by measurement, or by the use of reference marks on the commutator. The center of adjacent brushes should be 180° apart. This can be done, if necessary, while the machine is running by moving the rocker arm so that the brushes on one side will show the least spark, then adjust the brushes on the other side to the least-sparking point, and clamp them in place.

Another cause for sparking is that the brushes are not set at a neutral

point. This may be remedied by moving the rocker arm back and forth until the sparking stops.

If the brushes are not properly trimmed and set, they will spark. If sparking begins from this cause and

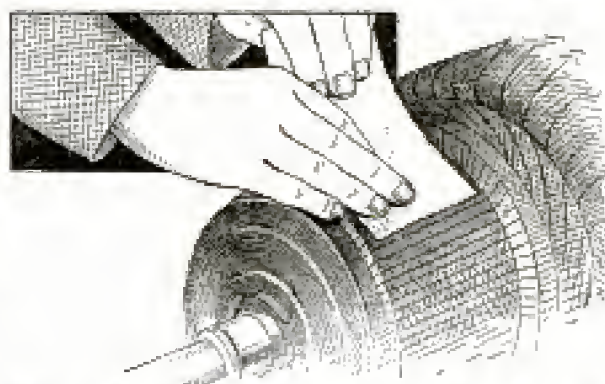


Fig. 1—Smoothing a Commutator with a Piece of Sandpaper Backed with a Piece of Heavy Cloth

the machine cannot be stopped, bend back the brushes and cut off the loose and ragged wires, if metal brushes are used, and retrim them as soon as possible after the run is over. If there are two or more brushes in each set, they may be removed one at a time, and properly trimmed ones put in the place during the run, on any low-voltage machine. To trim the brushes, first clean them from oil and dirt with benzine, soda, or potash, then file, or grind, them carefully by the aid of a standard jig, and reset carefully.

The brushes of a set should be adjusted separately until they are all in line and square with the same commutator bar, bearing evenly for their entire width, unless purposely set staggered. Adjust the pressure by the tension screws and springs until a light, firm, yet even, contact is made. The pressure should be about 1.25 lb. per square inch.

Fault of Commutator or Magnetic Field

The commutator may cause the brushes to spark by its being rough, worn in grooves, not round, or by one or more bars being too high or too low. To grind down a commutator, use fine sandpaper laid in a block, concaved to

fit the circumference. Never use emery cloth or paper, nor emery in any form. Polish with a soft, clean cloth. A method that may be employed in clean-

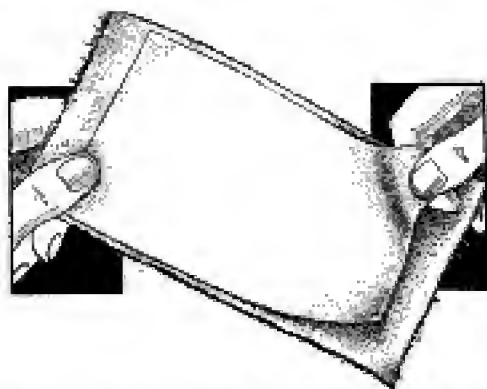


Fig. 2—The Heavy Cloth Extending over the End of the Sandpaper Prevents Any Copper Dust Passing under the Brushes

ing a commutator when the surface is not worn too badly is shown in Fig. 1. A piece of heavy cloth should be placed over the sandpaper, as shown in Fig. 2, which prevents the fine copper dust from being carried under the brushes. If the surface of the commutator is rough, the sandpaper should be held against the surface by means of a curved piece of pine instead of the fingers. The sandpaper should be given a slight endwise movement along the commutator, to prevent the formation of grooves.

If the surface is too badly worn to be ground down, turn it off with a special tool and rest while the armature is turning slowly in the bearings, or remove the armature and turn off the commutator with light cuts in a lathe. The armature, when set in its bearings, should have from $\frac{1}{16}$ to $\frac{1}{8}$ -in. play, so as to distribute the wear evenly and prevent wearing ruts and ridges. The brushes may be shifted sideways occasionally to assist in the distribution of the wear.

If one or more commutator bars are high, set each down with a block of wood, or a mallet, being careful not to bend, bruise, or injure the bar, and then tighten the clamping rings. If this does not remedy the fault, file, grind, or turn the high bar or bars down to the level of the other bars. The high bar may make the brushes

jump or vibrate, and cause them to "sing." If one or more bars are low in a commutator, turn down the others to true the surface and remove the low spots. The insulation between the bars will not wear as fast as the metal, and should be ground or turned down when necessary to remedy this fault.

A weak magnetic field will sometimes cause trouble, and this may be due to a broken circuit in the field. It can be remedied by repairing the broken line, and rewinding if the break is inside of the winding. A short circuit of the coils will cause the same trouble. If the short circuit is external, repair it, but if internal, the coil will need to be rewound. The same trouble will result if the dynamo is not properly wound, or does not have the proper amount of iron. In the latter case, the only remedy is to rebuild it entirely.

Excessive Current in Armatures

Sparking at the brushes is also the result of an excessive current in the armature, which is caused, in a generator, by too many lamps on the circuit (constant-potential system); by a ground or leak from a short circuit on the line, or by a dead short circuit on the line. In motors, it is caused by excessive voltage on a constant-potential circuit; by excessive amperage on a constant-current circuit; by friction, or by too great a load on the pulley.

To overcome the difficulties of the dynamo, reduce the number of lights and thus diminish the current called for on the plate. Test out, locate, and repair the ground. A dead short circuit will blow the safety fuse. Shut down the dynamo, locate the trouble, and repair it. Put in a new fuse before starting again. The fuse should not be inserted until the fault is corrected, as it will blow out again upon starting the machine. If the trouble is not located, the voltage of the machine should be brought up gradually from a low value, and the current output observed. An excessive current will indicate the trouble still ex-

ists, and the machine should not be operated until the trouble has been corrected.

In motors, the proper value of voltage should be used and no other. Make sure that the motor has the proper current capacity. Remedy any cause from undue friction, and reduce the load to the proper amount for the rating of the motor.

Fault of the Armature

A short-circuited coil in the armature will cause sparking at the brushes. A method of testing out, to find a short-circuited coil, is shown in Fig. 3. When a coil between the segments to which the voltmeter is connected is shorted, the reading will be very low. Examine the commutator and remove any copper dust, solder, or any metallic substance, that might be making a contact between the commutator bars. See that the clamping rings are properly insulated from the commutator bars, as well as from carbonized oil and copper dust or dirt which may form a short circuit. Test out for an internal short circuit or cross connection. To remedy such a trouble, reinsulate the conductor, change the connection, or rewind the armature. Examine the insulation of the brush holders. Dirt, oil, or copper dust may form a short circuit from the brush holder to the

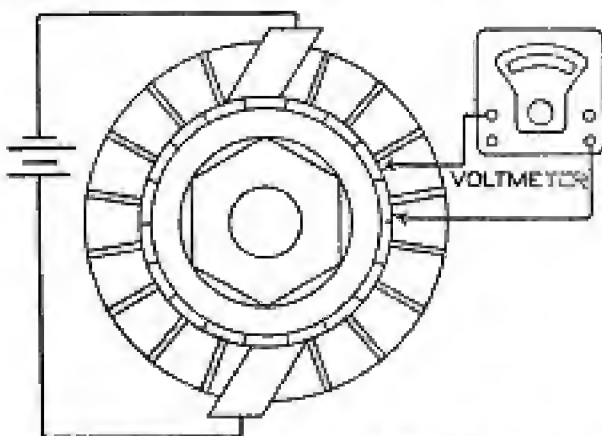


Fig. 3—Connecting a Voltmeter and Current to a Commutator to Test Out for a Short-Circuited Coil rocker arm, and thus short-circuit the machine.

A broken circuit in the armature will cause the same trouble. A run may be finished by bridging the break tem-

porarily, which is done by staggering the brushes till the run is finished. This is only a temporary makeshift to stop the sparking of the bar during

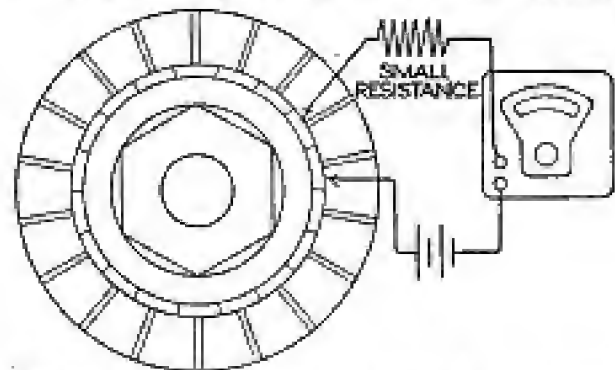


Fig. 4—Connections for an Ammeter to a Commutator to Test Out for an Open Armature Circuit

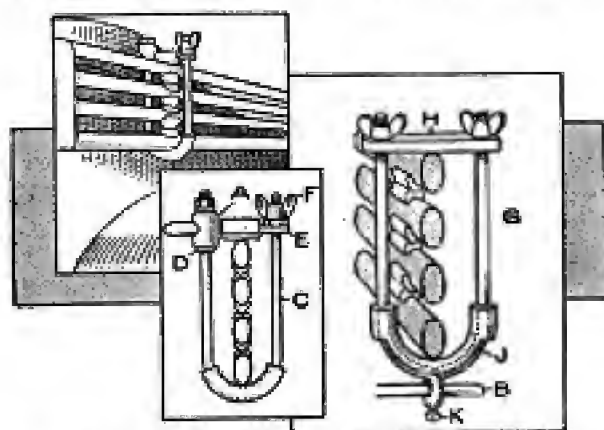
a run when the dynamo cannot be shut down and must be followed by testing out and repair. A method of testing for an open armature circuit is shown in Fig. 4. When the ammeter reads low, it indicates that there is an open coil between segments. If the dynamo can be shut down, look for a loose or broken connection to the bar, and if one is found, repair it. If the coil is broken inside, the only remedy is to rewind it. The break may be bridged temporarily by hammering the disconnected bar until it makes contact across the mica insulation to the next bar of the commutator. This remedy may be of use to complete a run, but the bars must be repaired and the insulation replaced when the fault is corrected. Another way to make the bridge across, is to solder two lugs of the commutator together or use a piece of heavy wire to cut out the broken coil. In doing so be careful not to short-circuit a good coil and thus make sparking from a short-circuited coil.

A cross connection in the armature will also cause the same trouble. The cross connections may have the same effect as a short circuit, and they are to be treated as such. Each coil should show a complete circuit with no connection to any other coil.

In repairing a fair-sized hole in an inner tube, it is better to place a patch on both sides, and then vulcanize.

Easily Adjusted Automobile-Top Holder

In the usual method of fastening automobile tops when down, leather straps are used to bind the ribs in



Automobile-Top Holder with Thumbscrew Adjustment, and Special Arrangement for Use with a Horizontal Bar

place. If the straps are not bound tight, the top will rattle. In order to prevent this noise, a strain must be put on the leather so as to reach a place where the strap will be tight. To avoid the tugging nuisance, and breaking of straps, an attachment may be made as illustrated, for automobiles having brackets similar to A, or a holder can be fitted to automobiles having a horizontal bar, as B, to support the top. In the former case, a rod, C, is selected which will enter the hole of the bracket A. This rod is upset, or a collar welded to it, at D, so that sufficient length will be allowed on the short end for the bracket A and a standard nut. The rod is then bent U-shaped to accommodate the several top ribs, sufficient length being allowed for a crosspiece, E, and thumb nut, F. The piece E is drilled to fit the rod C. It is covered with a piece of hose and the rod C is similarly covered at the bend to prevent marring of the ribs. In putting the top down, it is only necessary to swing the piece E out of the way, and drop the top into the U-shaped bracket, where it may be securely held by bringing E to bear on it, and screwing down the thumb nut F.

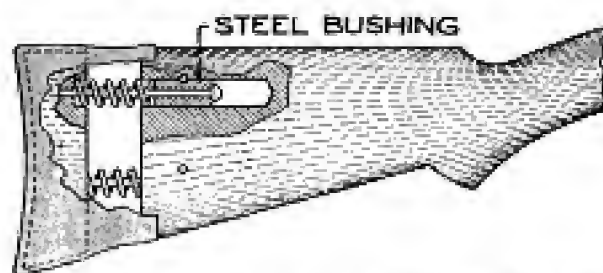
In the second case, the U-bracket may be formed of a suitable rod, forged

so as to fit the rod B, and with the ends G extended to accommodate the top ribs and the crosspiece H, thumb nuts being provided at the extreme ends. Protective covering can be placed around H, as before. For the lower part, one half of the hose should be removed at the center, as shown at J, so each of the ends can slip over one of the sides G; the half section will still provide the necessary protection. The setscrew K locks the bracket in position on the bar B.—Contributed by Chester S. Ricker, Indianapolis, Indiana.

Recoil on a Gun Stock

In order to lessen the kick of a gun, a recoil attachment can be used, as shown in the illustration. For this purpose, a special loose shoulder piece must be provided, or can be obtained by sawing the regular stock in two near the end. To keep the parts in line two $\frac{3}{8}$ -in. steel pins are necessary, being provided with heads at one end only. The loose shoulder end of the gunstock should be drilled through, to fit the $\frac{3}{8}$ -in. pins, and countersunk to about $\frac{1}{2}$ in. on the inner edge, to fit suitable recoil springs. Two $\frac{5}{8}$ -in. bushings should be provided to serve as guides for the pins.

In assembling the attachment, the bushings are first placed on the pins so that they will bear against the heads, whereupon the springs are inserted. The pins can then be put through the holes in the special shoulder piece, and their outer ends riveted



Recoil Device on a Gunstock to Take Up the Shock from the Firing

over to prevent them from pulling out with the recoil of the spring. In the main part of the gunstock, two holes

are drilled to fit the guide bushings, and counterbored for about $\frac{1}{2}$ in., if necessary, to fit the springs. These holes must extend sufficiently beyond the inner ends of the bushings so that the heads of the pins will not strike the stock when the springs are compressed to their limit. To fasten the bushings, holes are drilled for $\frac{1}{8}$ -in. pins, so that half of the pin is held by the gunstock and the remainder by the bushing. The opening in the gunstock may be covered with a strip of canvas, one edge being fastened to each piece of the stock; or, if preferred, a rubber casing can be used to cover the gap.—Contributed by L. Hamm, Moline, Ill.

Perforator for Postage Stamps

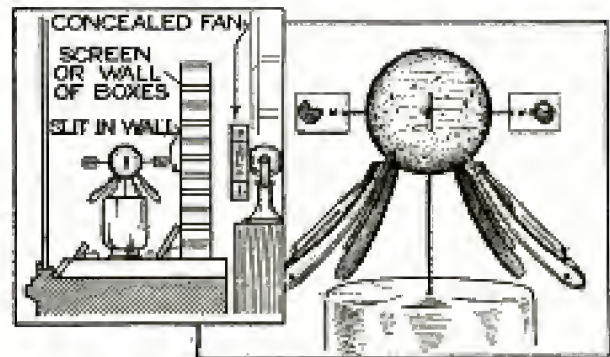
Where return envelopes are sent out with a stamp attached many of them are detached for personal use. This could be guarded against by the use of a stamp perforated with a device having a series of needles or prongs, as shown. These could be arranged to suit the fancy of the user. A stamp perforated with the needles is almost impossible to remove without being torn.



A Show-Window Attraction

One of the best methods of attracting the attention to a show window is to place in it some device which apparently operates of its own accord. Such an arrangement is shown in the illustration. It consists of an improvised paddle wheel driven by a concealed fan. The rotating device consists of a ball of cork, or other light material, to which are symmetrically hung razors, knives, toothbrushes, or similar articles, which will serve as paddles for the wheel. This ball is balanced on the point of a screw or

nail driven through a cork, which in turn fits in the neck of a bottle, thereby clearly indicating the absence of any

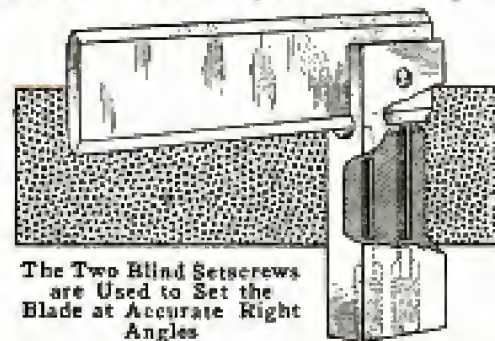


The Air Coming from the Slit Strikes the Projections on One Side Only

source of power through the base. On one side of the device a wall, or screen, must be provided, having slits, or holes, in it, and on the opposite side is placed a fan, carefully concealed from the observers. To rotate the ball, the fan is operated, which sends the air through the openings in the wall, causing it to strike the paddles and turn the ball.—Contributed by F. Armstrong, Pittsburgh, Pa.

An Adjustable Precision Square

A machinist's, or toolmaker's, square, of novel, yet practical design, is shown in the illustration. Instead of the blade being solidly attached to the base of the square, it is pivoted on a pin. The plungers exert pressure against the blade on opposite sides of the pin. These plungers in turn are actuated by two blind setscrews. All that is necessary to adjust the square is to turn the setscrews. This square is easily con-

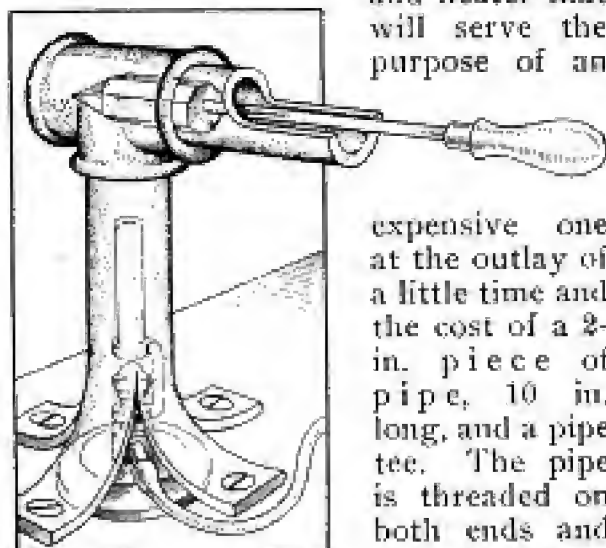


The Two Blind Setscrews are Used to Set the Blade at Accurate Right Angles

structed and may be made as accurate as it is possible to make any square.—Contributed by S. V. Brook, Hartford, Connecticut.

A Bench Soldering-Iron Heater

The handy man at home can provide himself with a soldering-iron holder and heater that will serve the purpose of an



expensive one at the outlay of a little time and the cost of a 2-in. piece of pipe, 10 in. long, and a pipe tee. The pipe is threaded on both ends and cut to make

two pieces, one 7 in., and the other, 3 in. long. The unthreaded end of the long piece is split, or sawed, to make it quartering; the pieces are turned out to form feet and holes are drilled in them. This pipe is screwed to the bench over a Bunsen burner. The tee is turned on the top of the pipe and the other short piece is screwed into one end of the tee. The short piece is then filed to the shape shown, to receive the soldering iron.—Contributed by O. F. Germaine, Mansfield, Ohio.

Bushing Valve Cap to Raise Spark Plug

Poorly designed valve caps on an automobile engine placed the spark plugs so low that it was difficult to



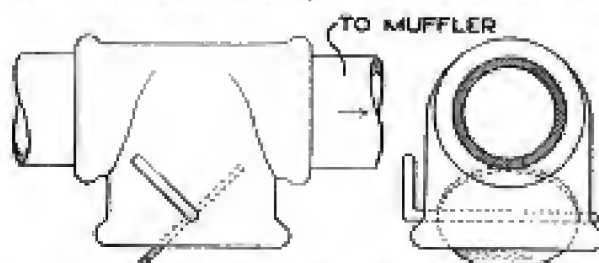
get a socket wrench on them when it became necessary to remove a plug. This also made the lower portion of the plugs extend into the combustion chamber, resulting in clogged platinum points and causing ignition trouble.

The difficulty was overcome by making a shoulder bushing to receive the plug, and enlarging the hole in the

cap to receive the bushing. The shoulder of the bushing was slotted to provide a means of turning it in place. The work of fitting four such bushings was quite a job, but it was well worth the time.—Contributed by Adolph Kline, New York City.

Muffler Cut-Out Made from Pipe Fitting

A simple and cheap muffler cut-out can be made for a gasoline engine from a pipe tee, a piece of sheet iron, and an iron rod. The tee should have a large side opening—unthreaded would be best. The valve consists of a thin sheet of stiff sheet metal, cut to a circular form, to fit the side outlet of the tee. The axis about which the valve turns consists of a round rod with one end bent at right angles. The other end should be sufficiently long to pass clear through the large part of the tee; the bent end simply forms the handle



Cut-Out Made of a Tee Fitting Having a Large Side Outlet for the Disk Valve

for operating the valve. The axis end of the rod should be slotted to receive the valve disk. The side outlet of the tee is suitably drilled for the rod. In assembling the parts, the disk is put in place, and the slotted end of the rod put through the tee straddling the disk.

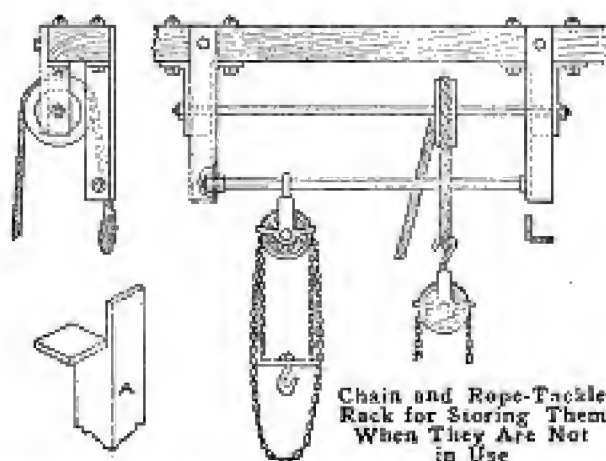
When carefully adjusted for proper operation, the disk and rod may be soldered together, or holes drilled through them, for rivets. The cut-out is then ready to be connected between the engine and muffler.—Contributed by D. C. Goff, Knoxville, Tenn.

CA machinist must remember that the warmth of the hand will change the size of a caliper or gauge of any kind.

Rack for Storing Chain or Rope Tackle

In order to store rope or chain tackle conveniently, a rack can be provided, as shown in the illustration. It consists of two frames, one for the tackle and the other for the hoisting gear. The first consists of two angle irons connected by a rod on which to suspend the tackle. The ends of the rod are threaded sufficiently so they can be fastened to the angle irons, with a nut on each side of the webs. The frame for the hoisting gear is similarly made but further provided with a loose sheave on its connecting rod, which should be free to slide back or forth, or revolve. The angle irons should be shorter than in the former case so that the sheave rod will be above the tackle support.

To rigidly fasten the frame, each of the angle irons should be cut at its upper end, with one web of each bent at right angles to its length, as shown at A, and each end drilled to fit a supporting bolt. The frames can then be placed and fastened to a convenient support overhead, so the sheave rope—used for raising or lowering the tackle—will tend to pull the tackle hook over the supporting rod when, by slightly lowering the hook, it will catch on the rod and be suspended from it. In taking down any tackle, the looped rope is first placed so as to catch under

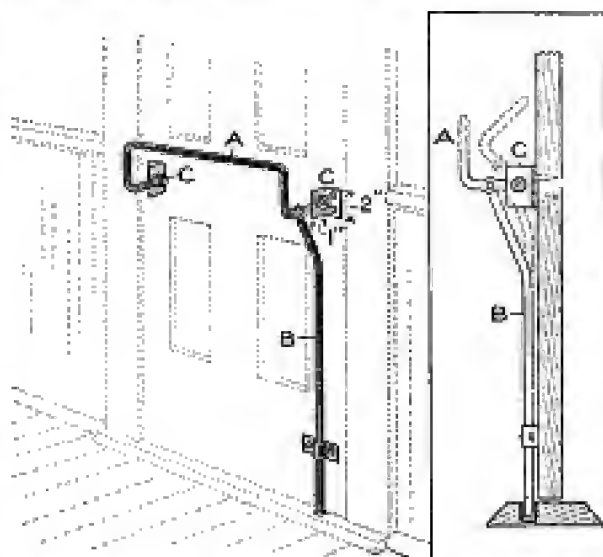


Chain and Rope-Tackle Rack for Storing Them When They Are Not in Use

the hook, which can then be raised off the rod, and the tackle lowered to the floor.—Contributed by John Harger, Honolulu, H. I.

A Lock for a Theater Emergency Exit

A good panic-proof emergency-door latch for theaters that is always locked



The First Person in a Rush for the Emergency Door Releases the Latch Automatically

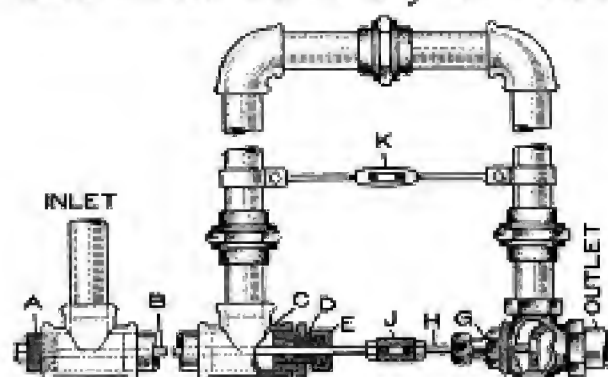
from the outside, but which complies with any fire ordinances, can be made at small cost in the following manner. The latch is formed of a rod, about $\frac{1}{2}$ in. in diameter. The piece A is bent as shown in the sketch and one end is flattened for $\frac{3}{4}$ in., through which a $\frac{1}{4}$ -in. hole is drilled, while the other end is flattened for 2 in. and provided with two $\frac{1}{4}$ -in. holes, one near the end, and the other $1\frac{1}{4}$ in. from the first hole.

The rod B is flattened on one end only, and a $\frac{1}{4}$ -in. hole drilled through this end. It is then bent, as shown, so that it will clear the door about $\frac{1}{2}$ in. The angles C are made of iron, 2 in. square and $\frac{1}{4}$ in. thick. These are bent at right angles, so that each part extends 1 in. Two holes are drilled in one end for screws, and a $\frac{1}{4}$ -in. hole is drilled in the other end, to admit a bolt to hinge the rod A. The parts are assembled with stove bolts having double nuts, so that the rods A and B will swing easily. The rod B engages in a hole in the floor, or preferably, in a small iron plate screwed to the floor. A light pressure on the bar A will raise the rod B from its keeper, and allow the door to swing open. On theater doors all other locks

should be removed. A rush for the door causes the latch to be released by pushing against it.—Contributed by R. R. Cantrell, Red Oak, Iowa.

Homemade Steam Trap

It is frequently desirable to have a trap for draining water from steam mains, but the purchase price for the manufactured article may not be on



Steam Trap Made of Pipe and Fittings to be Used with the Bend Lying on Its Side

hand. In most places sufficient odds and ends are lying around to construct one as shown in the figure. The necessary fittings are: two tees, two ells, one angle valve, six pipe nipples, three unions, one plug, one reducing bushing, one packing box, gland and nut, two bronze, or brass, valve stems, and a threaded coupling for the same.

The side outlet of one tee forms the inlet of the trap. One end of this tee is closed with a plug, A, which is drilled and tapped for a suitable brass, or bronze, rod, B, of sufficient length to extend about halfway between the uprights of the U-bend trap. The second tee, C, is fitted with a reducing bushing, D. Into this is screwed a packing box, E, which should be made to fit a gland and nut from a discarded valve. The angle valve G requires a few slight changes before it can be used for the trap. The valve stem should be turned down to the diameter of its projecting end, thereby permitting it to move back and forth without the necessity of rotating it. The valve stem H and the rod B are threaded and connected by means of a coupling, J. Lock nuts should be used to keep the valve in the set posi-

tion. Adjustment may be made by turning the stem H. Three unions are used in the pipes forming the U-part so that the trap may easily be assembled or removed without breaking the main line. Should the trap vibrate excessively, it will be necessary to bind the sides of the U-bend by means of a tie rod, K. Whenever the pipe line is full of water, the valve G should be open, allowing the water to leave at the outlet. When the pipe is drained and steam starts to flow, the steam, being hotter than the water, will cause the stem B to expand. This in turn forces the stem H and valve against the seat, thereby shutting off further escape of water or steam.—Contributed by H. L. Hauptmann, Cleveland, Ohio.

A Weed Remover

Having a hand cultivator which broke up the soil well but did not remove very many weeds, I tried the following plan with success: Some strong but rather small wire was stretched tightly between the teeth and fastened at such a height that the wire just cleared the surface of the ground. When in use the teeth break up the soil and the wire pulls out the weeds as it is drawn along close to the ground.—Contributed by Abner B. Shaw, N. Dartmouth, Mass.

Sign Painter's Palette

The conical tin caps of varnish and other similar cans come in very handy when one has to use small quantities of various colors on one job. The caps can be inserted in holes bored in a piece of board, or fastened to a tin plate with a bit of solder. The tin plate can be turned up at the edges.—Contributed by James M. Kane, Doylestown, Pa.



Core Boxes for Square and Rectangular Cores

By J. A. SHELLY

IT is not the purpose of this article to describe all devices used for making the kind of cores under this subject, but a number of the most common forms will be mentioned.

It is always best to have the core box part at opposite corners, unless they are very shallow or have plenty of draft, in which case they can be safely fastened at all four corners. There are cases where it is necessary to have the box part at all four corners, as, for example, when there are small projections on the four sides of the core, that cut into the sides of the core box and make it necessary to draw the sides of the box away in lines at right angles to the sides of the core.

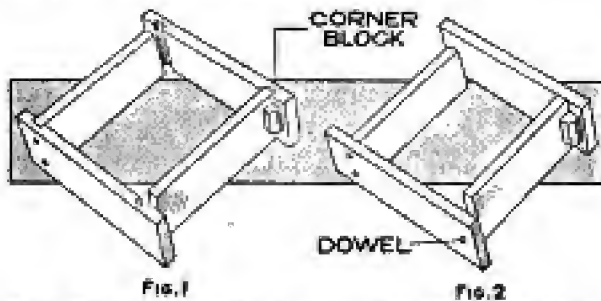


Fig. 1 Fig. 2
Two Ways of Forming the Joints to Make the Core Box Part on Opposite Corners

The most common kind, and probably the best corner joint, is the housed joint, shown in Fig. 1. By its construction, it effectually prevents the ramming out of the ends of the box. It is the standard form for first-class work.

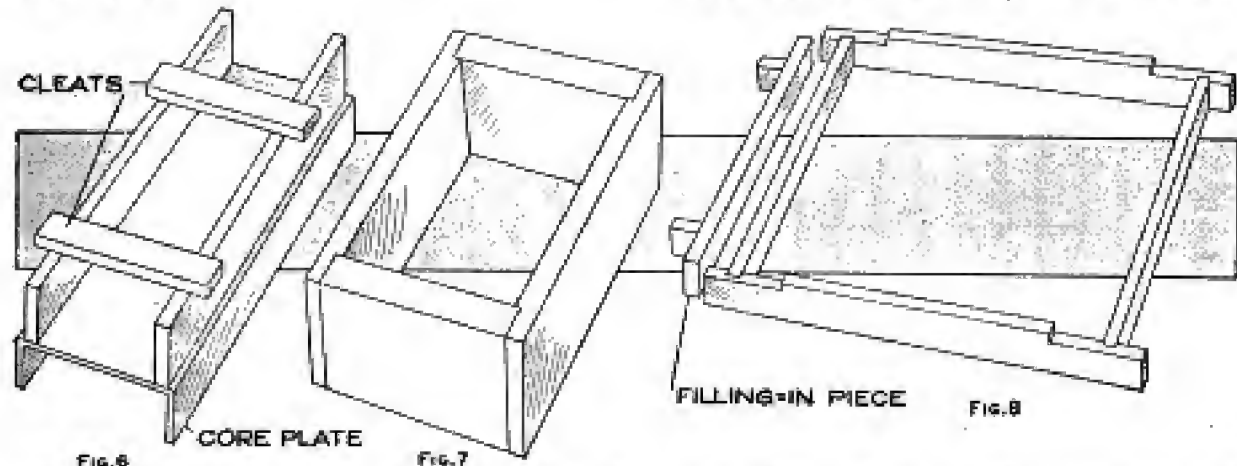


Fig. 3 Fig. 4 Fig. 5
Where It Is Necessary to Make a Long Core for a Column, or a Similar Piece, It Is Shaped on a Channel Iron with Straightedges, and Cores for Large Work are Made Up of Separate Pieces into Box Form

Where a cheaper job is required, the box shown in Fig. 2 is frequently used. It is of butt-joint construction

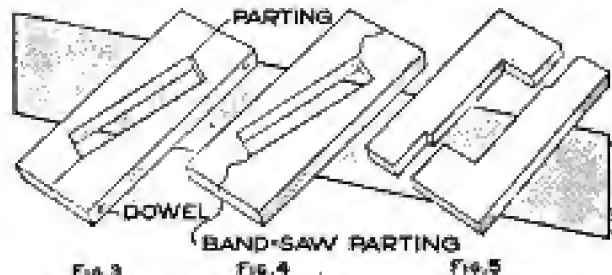


Fig. 3 Fig. 4 Fig. 5
Small and Thin Cores are Made in Boxes Formed of Two Pieces of Wood

and depends on dowel pins in the loose corners to withstand the end strain of ramming. This form is not to be compared with the one shown in Fig. 1, but where only a few cores are required, it answers every purpose.

For smaller cores of the same general shape, the box shown in Fig. 3 is the usual form. The two halves are cut from single pieces of wood and doweled together before the rectangle is laid out. Laying the rectangle out as shown makes it very easy to draw the sides of the box away from the core.

A core box made from a single piece of wood is shown in Fig. 4. It is cut out with a band saw. The irregular joint does away with the dowels. The joint line and rectangle are laid out before any cutting is done, and in drawing the lines for the rectangle, or square, as the case may be, allowance

must be made for the stock removed by the band saw in cutting on the joint line.

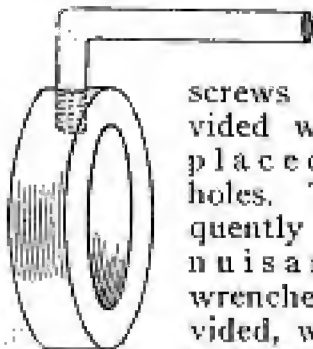
Another standard form that is in general use is shown in Fig. 5. This is used where a thin core is desired and when the thickness of the box will not permit dowels. The box is only used for small, light cores.

The device shown in Fig. 6 is extremely simple, and gives excellent results on long cores for columns, and similar work. Two parallel straightedges, placed as far apart as the depth or thickness of the core, constitute the core box. These straightedges are kept to the proper width, or distance apart, with battens, or cleats, fastened across the face with screws. These battens are spaced about 28 or 30 in. apart. Channel iron is used for the core plate, and it is only necessary to remove the battens to free the core.

It happens sometimes that a very large core is required, and to save lumber and the necessity of handling a large and heavy body of sand, the core is made in four pieces and set up in place in the mold, as shown in Fig. 7. The sketch, Fig. 8, shows the box for making the sides with both ends cut down to receive the end cores. A filling-in end piece is used in each end of this box, to form the short end cores.

Safety Dog for Small Lathe Work

A great many methods are used and tried for the protection of workmen from the danger of being caught in revolving set-



screws of lathe dogs. The screws are usually provided with hoods, or are placed in countersunk holes. These methods frequently turn out to be a nuisance, or special wrenches must be provided, which are frequently lost when required.

The simple lathe dog illustrated combines the necessary factors of

safety and convenience. It consists of a plain metal ring, drilled and tapped for a left-hand thread. A steel rod, threaded at one end to fit the washer, is bent with its ends at right angles to each other, forming the tail for the dog and the wrench for the setscrew. No sharp corners, or dangerous projections, are presented, and the thread being left-handed, the dog tends to grip the work more firmly as it is being driven by the lathe.

Testing Small Motors with a Magnetic Brake

In testing small motors by means of a prony brake the results are far from satisfactory, and other methods must be employed which are capable of giving more accurate and consistent tests. A method used with excellent results in testing very small motors of about $\frac{1}{20}$ hp. is shown in the illustration. The principal parts that constitute the testing device are a copper disk, A, mounted on the armature shaft; two electromagnets, B, connected by a yoke, C, the combination being mounted on a shaft, D, which is pivoted on the knife edges E and F, and a spring G, one end of which is fastened to the shaft D and the other end attached to a piece, H, mounted on the support J, as shown. The pointer K is attached to one end of the piece H, and so arranged that it may be moved over a graduated circular scale, laid out on the surface of the support J.

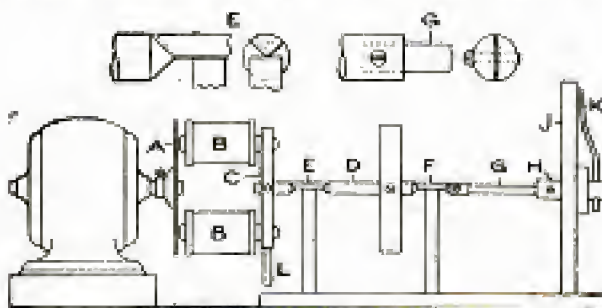
The operation of the device is as follows: When the disk A is revolved opposite to the poles of the electromagnets there are electric currents produced in the disk which react upon the magnets and tend to carry them around with the disk. Any movement of the electromagnets is prevented by turning the pointer K in the opposite direction to that in which the disk is turning, thus producing a torque in the spring until the pointer L is at its zero position. The position of the pointer should be noted and also the input to the motor together with its speed. If the torque produced in the

spring G were known, the output of the motor could be easily calculated.

To determine this torque, proceed as follows: Attach two lever arms to the yoke C so that they extend out on opposite sides perpendicular to the axis of the yoke. Suspend from these two lever arms two scale pans of exactly the same weight. The points of suspension of the two pans should be exactly the same distance from the center of the shaft. Turn the pointer K to the position it occupied when a balance was obtained during the test, and then place in the proper scale pan sufficient weights to bring the pointer L back to the zero mark. The product of the weight in pounds, required to produce a balance, and the distance in feet the point of suspension is from the center of the shaft, gives the torque in pound-feet. This value of the torque may then be substituted in the following equation and the horsepower calculated.

$$\text{Hp.} = \frac{\text{Torque} \times 6.2832 \times \text{R. P. M.}}{33,000}$$

The accuracy of the device will depend upon the care exercised in constructing and operating it. The deflections of the pointer K for the various outputs may be changed by varying the strength of the electromagnets or the size of the spring. The supports E



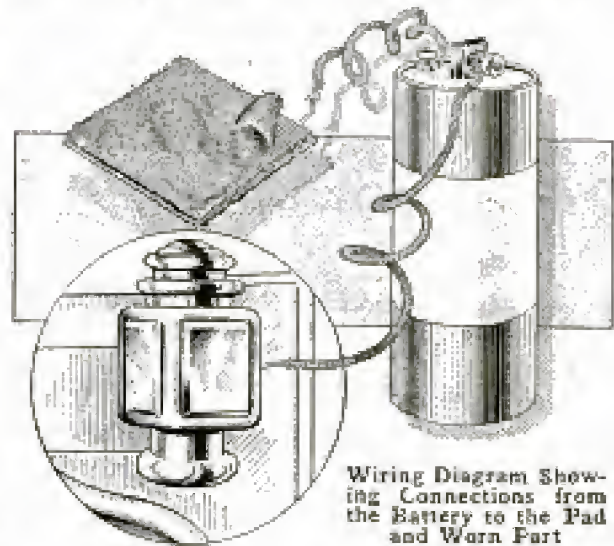
A Torque is Used as Basis for Calculations in Finding the Horsepower of a Small Motor

and F are so constructed that any movement of the shaft amounts to its turning on its own axis.

Ⓒ When brushing chips and dirt from a machine, be careful to keep them from falling into journals or parts where they will cause injury.

Recoating Worn Plated Parts on Automobiles

An outfit that will recoat worn nickel parts on automobiles without removing them, is shown in the illustration.



While this device will not put on the regular plate, it will refinish places where the nickel is worn off so they look like new and will last for some time.

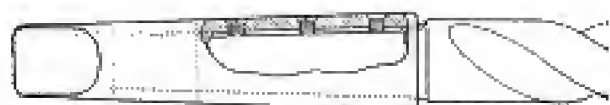
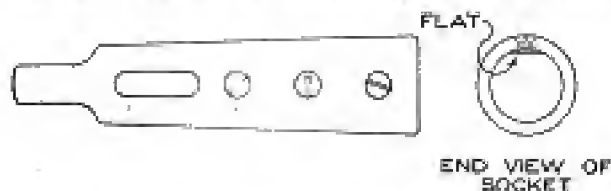
Procure two pieces of good flannel, each about 6 in. square, also a piece of brass screen of the same size, and sew them together, with the screen between the flannel pieces. At one corner of the screen, solder a piece of copper wire for a connection. Make the electrical connection from the pad to the battery and to the article to be plated, as shown.

Prepare a solution as follows: Place in a 2-qt. bottle 6 oz. of nitric acid, and 4 oz. of mercury. This mixing should be done in the open air, and when doing it, one should be very careful not to inhale the fumes, or vapor, as it is a deadly poison. Allow the mixture to stand until it stops boiling, then add nickel, about the weight of two five-cent pieces, and let the solution stand for half an hour. Fill the bottle with distilled, or rain, water.

Apply the solution to the pad and rub it over the part to be coated. The result will be a fine lustrous color that will wear for a considerable length of time.

Sockets for Broken-Shank Drills

When a drill shank is twisted off it is usually thrown away and a new one milled, or else some special socket

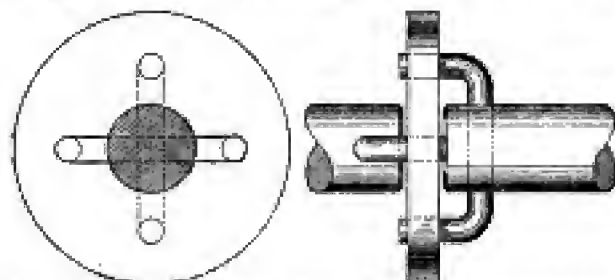


A Socket for Holding a Drill That Has Its Shank Twisted or Broken Off

must be provided to drive it. With but very little change, a regular socket can be used to drive such drills without spoiling its service for drills regularly provided with shanks. For this purpose, several holes are drilled and tapped in the socket to fit slotted, headless or flat-head setscrews. The twisted-off drill is ground to provide a flat bearing for the setscrews. When inserted in the regular socket, it can be securely held in place by the setscrews provided with flat bottoms, which are screwed against the flat place on the drill.—Contributed by J. V. Romig.

Simple Flexible Coupling for Transmitting Small Power

In connecting shafts that transmit small power, the simple flexible coupling illustrated can be made to serve the purpose as well as a complicated and expensive connection. The shafts are



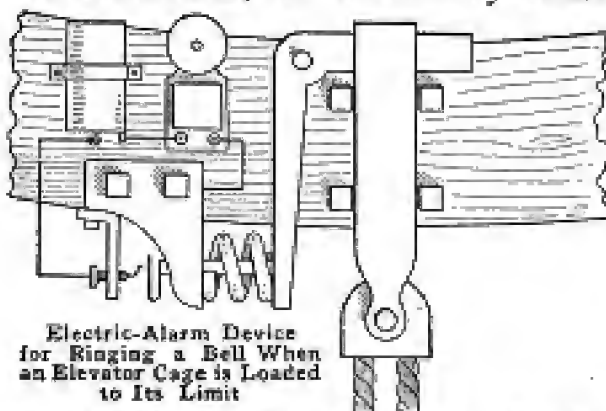
The Leather Disk Provides the Flexible Joint between the Revolving Shaft Ends

drilled for suitable-sized pins. These are bent at one end and then pressed or driven in place, after which the other

end is also bent, thereby forming a letter C with the parallel ends equally distant from the shaft. A driving disk is required to complete the coupling. The disk is a circular piece of thick leather, provided with four holes to match the projecting ends of the coupling pins, but sufficiently large to give ample clearance for flexibility and free end movement of the shafts.

Electric-Bell Alarm for Passenger Elevator

Speed governors, or brakes, are usually provided on passenger elevators to prevent them from dropping or traveling too fast. Hardly any attention is paid to the actual load carried, except to judge it approximately by the number of persons in the cage, which can only be a rough guess as regards actual conditions. In order to indicate when a limit load is being carried, an arrangement, as shown in the illustration, can be used by which



an electric alarm bell is rung. A bell-crank lever, attached to the cage frame, is supported at one end by a clevis fastened to the elevator cables; the other end fits up against a compression spring which rests against a bracket fastened to the elevator frame. One contact of the electric-circuit switch is rigidly fastened to the cage frame, and the other to a rod connected with the spring end of the bell crank. During an overload, the spring will be compressed sufficiently to allow the switch contacts to come together, thereby closing the circuit and ringing the bell.—Contributed by T. B. Lambert, Chicago, Ill.

Inexpensive Wood Pulleys

By PAUL A. BAUMEISTER

AT one time I had occasion to use some wood pulleys in connection with a small gasoline engine. The cost of manufactured pulleys was prohibitive, so it became necessary to devise some simple, cheap way to make them with the tools available. There were just three things to be considered, the material, how to turn them, and how to key them to the shafting.

The first was easy. A block of pine boards was built up in layers, as shown in Fig. 1. The joints between the boards of one layer were set at an angle to the joints of another layer. Enough layers were added in this way to make a block of sufficient thickness for a pulley of the desired width.

The boards were then screwed, or nailed, together, care being taken to leave no nails or screws projecting on the surface to be turned. A rough circle was then drawn on the boards, and the block was roughed out with a hand saw, to make the turning easier.

This latter operation was performed on an improvised lathe, made from a circular-saw mandrel and driven by a gasoline engine. A faceplate, as shown in Fig. 2, was made of wood. The pulley block was fastened to it with wood screws, and the whole mounted on the saw mandrel. An ordinary carpenter's chisel with a very slight bevel was used to do the cutting. Care must be taken to do all the turning from the face of the block, or the chisel will catch in the end grain of the wood and cause considerable trouble. Frequent grinding of the tool will help a great deal, as a sharp edge is the secret of smooth work. A slight crown is turned on the pulley to keep the belts from running off.

The pulley is bored to fit the shaft by using a narrow chisel. If the pulley is very wide, it may be easier to bore a few layers, then remove them, and finish the remainder. After the turning is finished, the pulley may be polished with some coarse sandpaper.

A very simple, as well as an effective, way of keying the pulley to the shaft is shown in Fig. 3. Assuming that the pulley is to be at least four layers thick, although this is not absolutely necessary, the two inner layers are notched, as shown in Figs. 1 and 3,

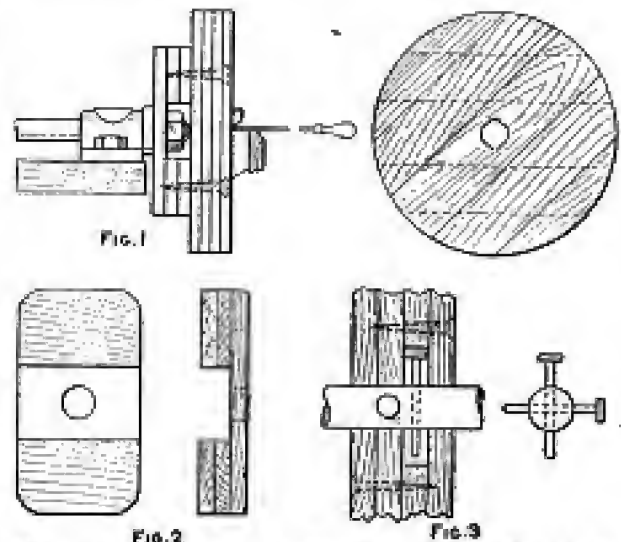


Fig. 2
Operations Necessary in Building Up a Pulley from Pieces of Board, and Method of Keying It

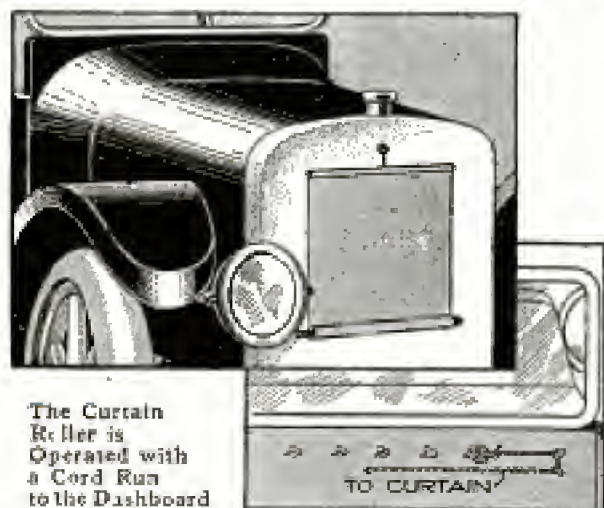
the notches in one being at right angles to the notches in the other. Two holes are drilled in the shaft, at right angles to each other and at a distance apart equal to one layer of boards. The keys are parts of large nails, the size of which will depend on the construction of the wheel. The pulley is then assembled by slipping the layers over the shaft so that the nails fit in the notched layers, as shown in Fig. 3. The end layers are put on, and all four screwed together. The outer layers will prevent the pulley from slipping on the shaft. If there is one joint in each layer which comes on a diameter, the pulley can be assembled without slipping it over the shaft. This would allow its being put on a shaft upon which there were already other pulleys.

More than likely the pulley will need some turning after assembling, as it is nearly impossible to bore the pulley absolutely true. This can be done by

driving in wood wedges between the pulley and the shaft. If the face is not smooth, a light cut can be taken while the pulley is in place, or coarse sandpaper can be used. If just ordinary care is taken, good serviceable pulleys can be made, even though they may look a bit more clumsy than those purchased of a regular manufacturer.

Automobile-Radiator Cover for Winter

The owner of an automobile, having almost constant use for his car, desired to have some arrangement for a



radiator cover that could be regulated from the driver's seat so that, in going against the wind, very little air should be admitted to the radiator, and when turning with the wind, it could be changed without stopping and getting out of the car. A short curtain roller, with its attachments, was procured and fastened over the open space in the radiator covering. A piece of the same material as used for the covering was attached to the curtain roller as a curtain, and a cord was fastened to the stick at the bottom.

The cord was passed through eye-lets set to run it through the dashboard, where a ring was tied to its end. Hooks were screwed into the dashboard at various points over which the ring is slipped in making the curtain adjustments. It is only necessary to give attention to the cord end, when turning toward or with a brisk cold

wind, to regulate the proper amount of air for cooling the radiator.

Lifting Microscopic Cover Glasses

To lift the very thin microscopic cover glasses in research work one person employs a device as follows: The device consists of a small brass tube about the size of a lead pencil, with a brass plate on one end, having a hole in its center, and a rubber bulb on the other—one taken from a medicine dropper. To lift one of these delicate glasses it is only necessary to moisten the surface of the brass plate, press the rubber bulb and then press the brass plate upon the glass. The suction holds it in place until released by pressing the bulb.

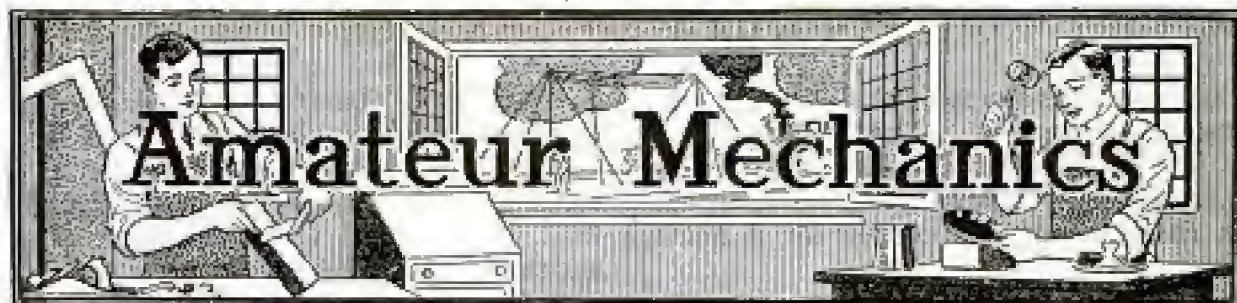
Storing Sulphuric Acid

Sulphuric acid that is kept for any length of time in bottles not having a glass stopper, will become blackened by particles of carbon and organic matter resulting from contact of the acid with the cork, which will be quickly destroyed. The acid should be kept in glass-stoppered bottles. However, the blackened acid need not be thrown away, as it will do very well for charging batteries, and for many other purposes where extreme purity is not essential.

Repairing a Broken Spirit-Level Bulb

A carpenter accidentally broke his spirit level and not being able to purchase a new glass and being sorely in need of a level, he repaired it in the following manner: The glass being broken on one end, the tube was filled with alcohol and then the opening sealed with sealing wax. The glass was put back in the frame and adjusted, and it worked as well as before.

Keep all automobile electric globes screwed tightly in their sockets to prevent the breaking of the filaments by sudden jars.



A Musical Doorbell

By H. MARCELLE

A. M. 7-781

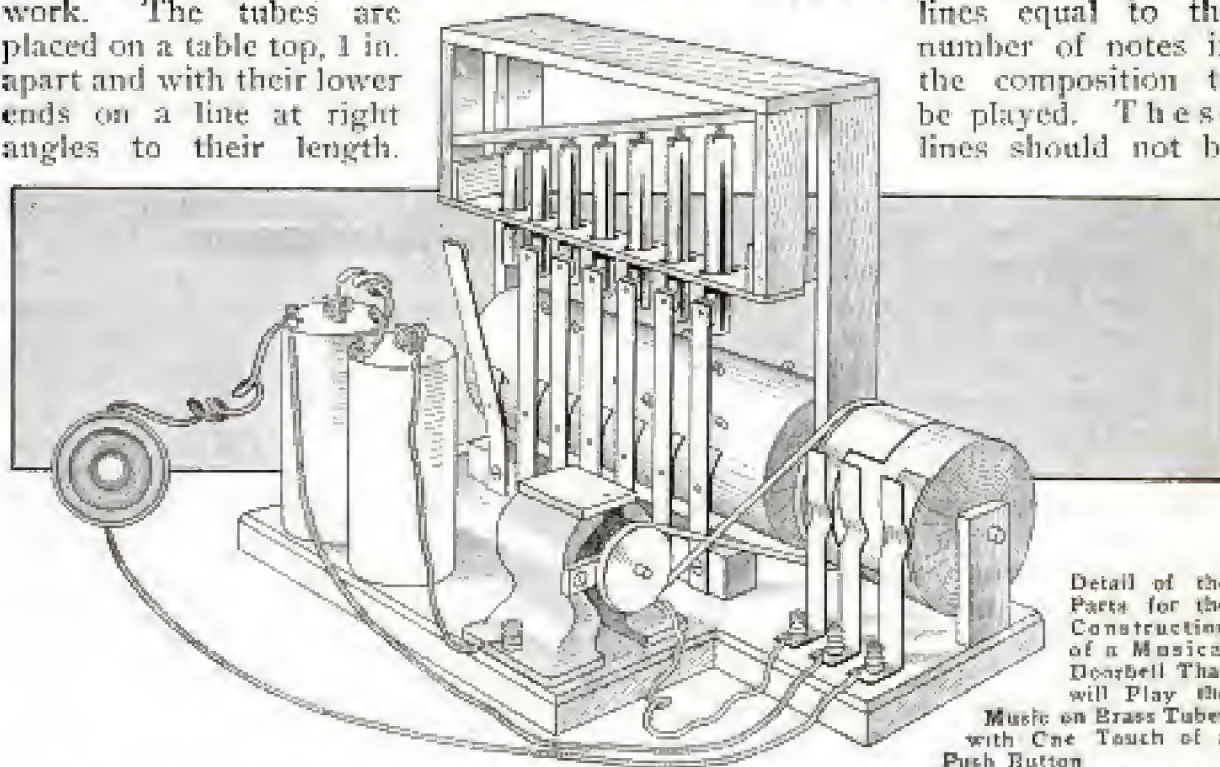
IN the construction of this doorbell it is best to purchase a small instrument known as the "tubaphone." It consists of a rack with several pieces of brass tubing cut to different lengths to give the proper tones as they are struck. Such an instrument with eight tubes will play almost any tune, and can be purchased from 50 cents up, depending on the size. Brass tubes can be purchased, cut, and toned, but the time taken in doing this is worth more than the price of the instrument, and no changes are necessary in it to make the doorbell.

Several strips of pine, 2 in. wide and $\frac{7}{8}$ in. thick, are procured for the framework. The tubes are placed on a table top, 1 in. apart and with their lower ends on a line at right angles to their length.

additional material to fasten on the ends of two uprights, which are cut long enough to admit the longest tube and allow sufficient room for a large roller and space at the top to swing the tubes.

A base is cut from a board, $\frac{7}{8}$ in. thick and of sufficient size to admit the roller and tube rack, together with a small battery motor. The tube rack is fastened to the back of this base by making a tenon on the lower end of each upright, and a mortise in the base-board to receive it.

A roller is turned from a piece of soft pine, large enough to provide room on its surface for a number of horizontal lines equal to the number of notes in the composition to be played. These lines should not be



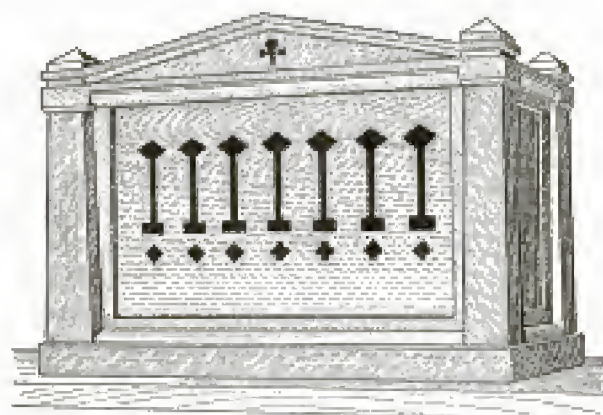
Detail of the Parts for the Construction of a Musical Doorbell That will Play the

Music on Brass Tubes with One Touch of a Push Button

Allow a space of 1 in. outside the first and last tube, and cut a piece of the wood to this length, allowing sufficient

too close together. Supposing the music it is desired to play has 15 notes in its composition, then 15 horizontal

lines must be spaced evenly on the surface of the roller. The length of the roller should be a free-working fit between the uprights. A $\frac{1}{4}$ -in. steel rod is run through its center for a shaft,



The Appearance of the Doorbell Is That of a Mission Clock on a Mantel

allowing sufficient ends for the bearings, and, in addition, at one end sufficient length for a pulley.

The motor is lined up on the base, so that its pulley wheel will run a belt on the large wheel of the roller. The current is turned on after making belt and wiring connections, a lead pencil is held directly centering the place where each tube hangs, and a line is drawn on the circumference of the roller.

A $\frac{1}{8}$ -in. hole is drilled through each tube, near one end, and a piece of catgut string run into it to make a hanger. A piece of board, long enough to fit between the uprights when placed on the slope formed by the upper ends of the tubes after their lower ends are set straight on a line at right angles to their length, and wide enough to swing the tubes clear of the frame, is fastened in place, as shown. Small screw eyes are turned into the under side of this board, at even spacings of 1 in., and used to swing the tubes by the catgut strings. Another piece of board, the same width as the former, is placed, perfectly horizontal, between the uprights a short distance above the lower ends of the hanging tubes. Evenly spaced holes are bored in this cross-piece to admit the ends of the tubes. The holes should be of such size that when they are lined with a piece of felt,

the tubes will have a little play without touching the sides at any point.

The hammers are each made of a strip of sheet brass, having a length that will extend from the base to a short distance above the lower ends of the tubes. A hole is drilled in each end of the strip, the lower one being of a size to fasten it to the base cross-piece with a round-head wood screw. The hole in the upper end is used to fasten a small block of wood with a screw, for the hammer head. A small strip of felt is glued to the striking side of the block. Another piece of brass, used for a trip, is fastened to the center part of each long piece with rivets, so that its upper end will be near the center of the roller for height, and strike the end of a small peg driven into the roller. The length of these pieces, in fact, of all pieces, will depend on the length of the tubes in the tubaphone and the size roller required for the music.

The setting of the pegs in the roller requires some patience in order to get the tune correct, but one mistake will be of more value than an hour's description. The pegs can be procured from a shoemaker. If the roller is of pine, they can be driven into the wood of the roller with a hammer.

With ordinary connections to the push button and motor, the mechanism will only run while the push button is being pressed. A device that will cause the piece of music to be played through to the finish after the push button is pushed for a short time, consists of a turned piece of wood fastened to the outside surface of the driving wheel on the roller. This piece of wood should be carefully set, so that its outside surface will be true as it revolves. Three brushes, made of copper strips, are fastened to the base. The length of these brushes will depend on the size of the roller and height of the block of wood. They should be evenly spaced and fastened, so that they will be insulated from each other. One strip of brass, or copper, is fastened around the turned piece of wood. This strip must be as wide as two brushes,

except for a short distance to make a break in the electrical circuit. The notch in the strip, to make this break, should be on the outside edge where it will disconnect the center brush, and its location on the turned piece of wood should be on a line with the end and the beginning of the pegs for the music. Another short strip is fastened to the turned piece of wood, where it will make a contact with the first brush when the second or middle brush is in the notch, or disconnected, and is connected to the other notched strip with a piece of wire run beneath the wood.

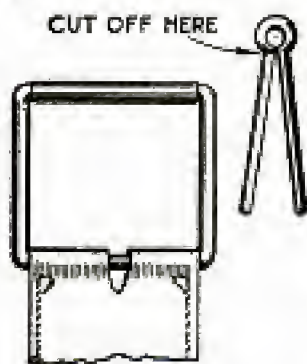
The wiring shown will make it possible to start the motor with the push button which will turn the roll far enough to connect the center brush; then the roller will turn until the music is played, at which point it will stop and remain in rest until the push button again makes the contact.

The entire mechanism can be made to set on the mantel or shelf, incased like a mission clock, and the wires running to it may be concealed.

Replacing Buckle Tongues

Having several buckles without tongues I tried to repair them with pieces of wire, but could not get them to bend short enough to fasten around the buckle frame. Some cotters were at hand and seeing them gave me the idea of using one leg, with the eye part, as a tongue.

By using the proper-sized cotter, a substantial and quickly made repair will be the result.—Contributed by Everett Hoar, Bowmanville, Ont.



☞ Bread crumbs thoroughly rubbed over a pencil drawing will remove most of the dirt and without disturbing the pencil lines.

Drying Towels in Photographer's Dark Room

In doing a large amount of photographic work the towel becomes wet, and to dry the hands on it is impos-



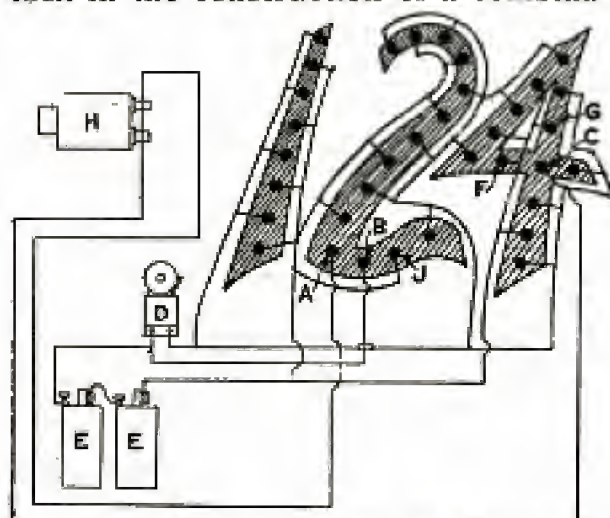
An Electric Globe Makes Heat in the Spool for Drying a Portion of the Towel

sible. To obviate this annoyance, I made a galvanized-iron pipe, about 2 ft. long and 8 in. in diameter, with a disk, or circular piece, of metal about 10 in. in diameter soldered on each end to form flanges. One flange was fastened to the wall of the dark room in a convenient place to support the device. On the inside of the spool, or towel support, an ordinary incandescent electric globe was placed. The heat of the lamp would easily dry 12 in. of the towel, and when the dry part was pulled down for use another wet portion was brought into position for drying.

Those who have tried to handle gelatin dry plates with moist hands will readily appreciate the value of this simple contrivance. The lamp in the spool is connected on the switch with the ruby light, so that it is not forgotten, when leaving the room, to turn it out.—Contributed by T. B. Lambert, Chicago.

A Combination Electrically Operated Door Lock

The illustration shows a very useful application of an ordinary electric door lock in the construction of a combina-



The Brass-Tack Heads Holding the Numerals in Place Constitute the Combination Points

tion lock and alarm to be operated from the outside of the building.

The three numerals, 1, 2, and 4, or any other combination of numbers constituting the house number on a door, are made of some kind of insulating material and fastened in place on a base of insulating fiber, or wood, about $\frac{1}{4}$ in. thick, by means of ordinary brass-headed tacks, as indicated by the black dots. The tacks will extend through the base a short distance so the electrical connections may be made by soldering wires to them, as shown by the diagram, alternate tacks being connected together with the exception of three; for instance, A, B, and C.

The terminals of the leads that are connected to alternate tacks are in turn connected to the terminals of a circuit composed of an ordinary vibrating bell, D, and battery, E. If any two adjacent tack heads be connected together, except tacks A, B, and C, the bell circuit will be completed and the bell ring, which will serve as an indication that some one is tampering with the circuit. The person knowing the combination, connects the tack heads A and B, and at the same time connects the tack head C with F or G, or any

other tack head that is connected to the plus side of the battery, whereby a circuit will be completed through the lock H and the door is opened. Any metallic substance, such as a knife, key, or finger ring, may be used in making the above indicated connection, and there will be no need of carrying a key for this particular door so long as the combination is known.

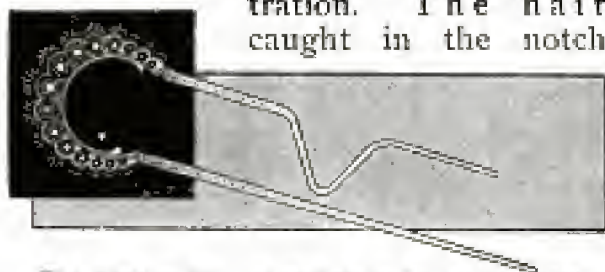
The base upon which the numbers are mounted and through which the points of the tacks protrude, should be mounted on a second base that has a recess cut in its surface to accommodate the wires and points of the tacks.

The combination may be made more or less complicated, as desired, by connecting the tacks in different ways, and by using a separate battery for the bell and lock. The circuit leading to the door lock, if there is one already installed, may be used and then no extra circuit is needed.

Such a device has been used on a private-desk drawer with entire satisfaction. The battery was placed in the back end of the drawer, and if it happened to fail, a new one could be connected to the points B and J so that the drawer could be opened and a new battery put in.

Lock for a Fancy Hairpin

To avoid losing a fancy hairpin, bend one leg of the pin as shown in the illustration. The hair caught in the notch



The Bend in the Pin will Hold in the Hair and Prevent the Loss of the Pin

formed by the bend will prevent the pin from dropping out.—Contributed by W. C. Loy, Rochester, Ind.

CA metal surface polished with oil will keep clean longer than when polished dry.

Trick Bottles and Glasses

BY GEORGE W. CATLIN

The performer presents to his audience two pasteboard covers, one bottle and one glass. Saying that he

press by using a round copper tube, with fine emery applied to its end, as a drill. The hole should be so placed



Under Each Cover Used Is a Bottle and Glass, and by Pinching the Cover the Bottle is Made to Rise with It, Thus Leaving the Glass in View

wishes to secure the safety of the bottle and glass, he places covers over them, cautioning the audience to note carefully which cover incloses the glass and which the bottle. Then he says that, to prevent any misunderstanding as to their positions, it is desired the audience designate which cover holds the glass. The response will be unanimous, "the left" or "the right" as the case may be, but on raising that cover the bottle is exposed. Covering the bottle again, and asking the audience if they were quite sure that their eyes did not deceive them, he states that the glass is really under the cover just lifted and returned to its place. To prove it, the cover is lifted again, to show the glass this time. The changing can be done as often as desired, or will amuse the crowd.

The secret of the trick consists in the use of two covers, two bottles and two glasses, and the manner of performing it is as follows: The bottles are bottomless and of such size as to admit the glass without sticking. A round hole is cut in one side of each bottle, about $2\frac{1}{2}$ in. above the bottom. This can be accomplished in a drill

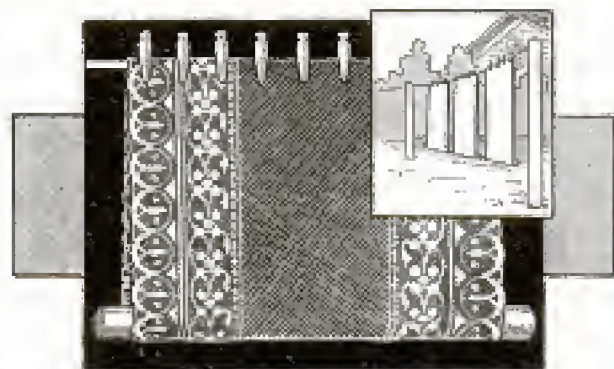
that a finger will strike the top of the glass when both bottle and glass are set on the same surface. If dark-colored bottles are used, a false bottom can be made and fitted in each bottle above the upper edge of the glass. This bottom can be cemented in place and made liquid-tight, so that some wine may be placed in the bottle and poured into the opposite glass to show that it holds liquid. In doing this part of the trick, make no more changes with the wine in one glass.

Under each cover is a bottle and tumbler, and by pinching the cover, the bottle is made to rise with it, thus leaving the tumbler in view. When it is necessary to show the bottle, just raise the cover, and the bottle covers the glass. When the bottle is lifted from the table, the thumb is inserted in the hole to press the tumbler against the opposite side, where it is held and raised with the bottle. Be sure to keep the side of the bottles with the hole back and away from the audience.

It will be seen that it matters not which cover is mentioned; the performer can show just the article he desires.

Stretching a Curtain without a Frame

A good way to avoid using the ordinary four-pole curtain stretcher is to make use of the following method.

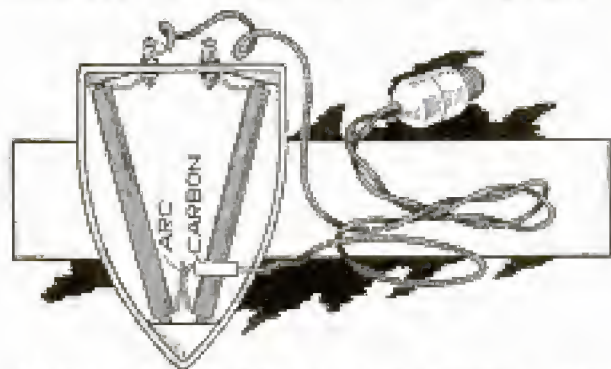


A Lace Curtain Hung Double on a Line with a Pole Inserted in the Fold

Take the lace curtain and fold it once lengthwise; then pin it up on a tightly stretched line with a large number of clothespins, and slip a clean pole between the two sides to keep it taut. This method not only stretches the curtain satisfactorily, but saves considerable time otherwise required in pinning the curtain to the four-sided frame.—Contributed by H. Wynning, Chicago, Ill.

Welding Small Resistance-Wire Connections

In making connections, especially in electrical heating devices subject to high temperatures, it is out of the question to use solder, since the temperature reached in the device would cause



An Arc is Formed with a Piece of Carbon, to Weld the Twisted Ends of Wire Together

the solder to melt and run out. A convenient arrangement for welding the connections of flatirons, or any other

fine wires, is shown in the illustration. The ends of the wires to be welded are twisted together, and the weld is completed by forming an arc, one electrode of which is the twisted connection and the other a piece of carbon. The resistance of the heating unit in the iron is sufficient to limit the amount of the current flow so that a short circuit does not result.—Contributed by G. Irving Davis, Albany, N. Y.

Bench with Folding Seats

To provide a bench with seats, or shelves, which cannot easily be taken away unless the table is brought along, hinged brackets are attached to stationary crosspieces, which are fastened



Bench, or Table, with a Seat on Each Side That can be Folded for Carrying Purposes

on the extended end braces of the table. When in use, the brackets are turned down, thereby providing a rigid support for anything that may be put on them. If it is desirable to have the brackets out of the way, as when carrying the bench, it is only necessary to fold them up.—Contributed by J. M. Kane, Doylestown, Pa.

Rim of Wire Wastebasket Wrapped with Felt

In offices where wire wastebaskets are used, the finish of the desks is often marred by the top rim of the baskets rubbing against them. This can be overcome by wrapping strips of felt around the rim to form a buffer.—Contributed by Miss F. D. Schweiger, Kansas City, Mo.

Fishing-Rod Making and Angling

BY STILLMAN TAYLOR

Box 47, Deep River
Conn.

PART I—A One-Piece Casting Rod

THE pleasures of outdoor life are most keenly enjoyed by those sportsmen who are familiar with all the little tricks—the “ins and outs”—of the open. It is the active participation in any chosen sport which makes the sport well worth while, for the enjoyment gleaned from little journeys to forest and stream largely rests with the outer's own knowledge of his sport. Not all of the fun of fishing lies in the catching of the fish, since the satisfaction which comes through handling a well-balanced rod and tackle must be reckoned the chief contributor to the outing. In other words, the pleasures of fishing do not depend so much upon the number of fish caught, as the manner in which the person fishes for them. The rod is naturally the first and important consideration in the angler's kit, and it is the purpose of these articles to set forth, at first, a few hints which my own long experience leads me to think may be of some assistance to those anglers who enjoy making and repairing their own rods and tackle, to be followed, later, by some suggestions on the art of angling generally. The hints given are merely my own methods, and while they may not be the best way of accomplishing the desired end, a good fishing rod may be constructed. Like the majority of amateurs, I have achieved the desired results with a few common tools, namely, a saw, plane, jackknife, file, and sandpaper. These simple tools are really all that is needed to turn out a serviceable and well-finished rod of excellent action.

Kind of Material

The great elasticity and durability of the split-cane or split-bamboo rod cannot be easily disputed. The hand-made split bamboo is unquestionably the best rod for every kind of fishing, but it is also the most expensive and the most difficult material for the amateur to work. In making the first rod or two, the beginner will be better sat-

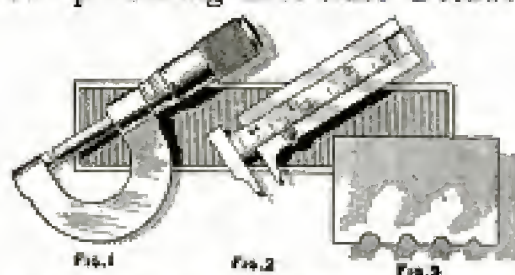
isfied with the results in making a good solid-wood rod. Of course, glued-up split-bamboo butts, joints, and tip stock may be purchased, and if the angler is determined to have only bamboo, it is advisable to purchase these built-up sections rather than to risk certain failure by attempting to glue the cane. However, there are several good woods particularly well adapted for rod making, and while slightly inferior to the finest bamboo in elasticity and spring, the carefully made solid-wood rod is good enough for any angler and will probably suit the average fisherman as well as any rod that can be purchased.

Bethabara, or washaba, a native wood of British Guinea, makes a fine rod, but it is a heavy wood, very hard, and for this reason is perhaps less desirable than all other woods. With the single exception of snakewood it is the heaviest wood for rod making and is only used for short bait-casting rods. Possessing considerable strength Bethabara can be worked quite slender, and a 5-ft. casting tip can be safely made of 5 oz. weight.

Greenheart, a South American wood, is popular alike with manufacturers and amateur rod makers, and 90 per cent of the better class of solid-wood rods are made of this material. It resembles Bethabara in color, but is lighter in weight, although it apparently possesses about the same strength and elasticity. In point of fact, there is little, if any, choice between these woods, and providing sound and well-selected wood is used, the merits of a rod made of Bethabara or greenheart are more likely to be due to the careful workmanship of the maker than to the variety of the wood used.

Dagame, or dagama, a native of the forests of Cuba, is in many respects the ideal material for rod making, as it has strength and elasticity. This wood is straight-grained and free from

knots, which makes it easily worked; it polishes well and is durable. While there is always more or less difficulty about procuring first-class Bethabara



Two Tools for Gauging the Diameter of the Rods, and a Homemade Scraper

and greenheart, dagame of good quality is easily obtained.

Lancewood is much used in turning out the cheaper grades of fishing rods, but it is somewhat soft and has a marked tendency to take set under the strain of fishing and warp out of shape. It is less expensive than the other woods, and while it has a straight and even grain, there are numerous small knots present which make this material less satisfactory to work than the other woods. For heavy sea rods, lancewood may serve the purpose fairly well, but for the smaller fishing tools this material is inferior to Bethabara, greenheart, and dagame. Other woods are often used, and while a good rod may be frequently made from almost any of them, the three mentioned are held in the highest esteem by the angling fraternity. For the first rod, the amateur will make no mistake in selecting dagame, whether the slender fly rod or the more easily constructed short bait-casting tool is to be made.

The Necessary Tools

The construction of a thoroughly well-made and nicely balanced rod is more a matter of careful work than outfit, but a few suitable tools will greatly facilitate the labor. A good firm workbench, or table, 4 ft. or more in length, will be needed. A regulation bench vise will come in handy, but one of the small iron vises will do very well. A couple of iron planes, one of medium size for rough planing-up work, and a small 4-in. block plane for finishing, will be required. As the cut-

ters of the planes must be kept as sharp as possible to do good work, a small oilstone—preferably one in a wood case with cover to keep out dust—will be needed; a coarse single-cut mill file about 16 in. long; a few sheets of No. 1 and No. 0 sandpaper; a sheet or two of fine emery cloth; a small thin “back” or other saw, and a steel cabinet scraper.

A caliper of some kind is a necessity, and while the best is a micrometer, Fig. 1, registering to a thousandth part of an inch, as well as indicating 8ths, 16ths, 32ds, and 64ths, this tool is somewhat expensive, but a very good caliper may be had in the sliding-arm type, Fig. 2, with the scale graduated to 64ths and taking work up to 2 in. in diameter. Cheaper measuring gauges are to be had in plenty, but as the brass and boxwood scales are provided only with coarse graduations, the better quality of mechanics’ tools will give better satisfaction.

The set of grooved planes used by the professional rod makers are rather expensive, although they are most convenient for quickly rounding up the rod to the desired diameter. However, the beginner may dispense with the planes by making the tool illustrated in Fig. 3. To make this handy little tool purchase a steel wood scraper, such as cabinetmakers use, and file a series of grooves along the edges with a round file. File at right angles to the steel, finishing up with a finer file to give a



Fig. 4

sharp cutting edge. The tool thus made is very handy for scraping the rod after it has been roughly rounded

with the plane. Its use will be mentioned later on in the description.

Five-Foot Bait-Casting Rod

The short one-piece bait-casting rod with but one ferrule is the easiest rod to make, and for this reason the beginner will do well to select this popular type for the first attempt. As the total length of the rod is to measure

5 ft., exclusive of the agate tip, the wood should be 1 or 2 in. longer to allow for cutting down to 60 inches.

Having selected a good strip of

grasp distance by running a knife mark around the rod 12 in. from the butt end.

Lay out a diagram showing the full length of the rod by placing a strip of

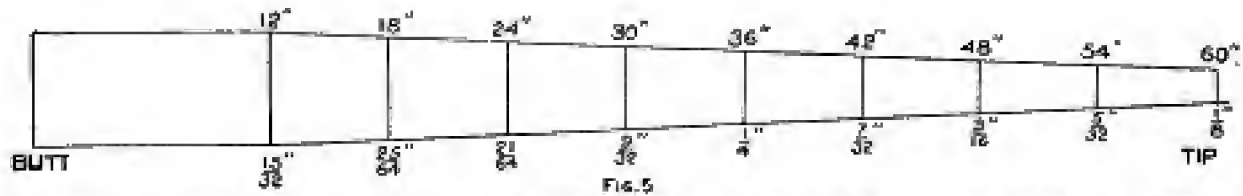


Diagram or Layout for a One-Piece Bait-Casting Rod, Showing Calipered Dimensions for Each Six Inches of Length. A Paper Pattern of Any Rod may be Drawn Up, Providing the Amateur Rod Maker Has a Rod to Use for a Pattern, or Possesses the Exact Diameter of the Rod at Intervals of Six Inches along Its Length

dagame, $\frac{5}{8}$ in. square, run the plane along each side and from both ends. This will determine the direction in which the grain runs. Drill two holes at the end decided upon for the butt, spacing them about $\frac{1}{4}$ in. from the end, as shown in Fig. 4. Drive a stout brad in the corner of the bench top and hook the butt end over the nail. By rigging the stick up in this manner it will be securely held, and planing may be done with the grain with greater ease and accuracy than when the end of the stick is butted up against a cleat nailed to the bench top.

The wood should be planed straight and true from end to end and calipered until it is $\frac{1}{2}$ in. square. It may appear crooked, but this need not trouble one at this stage of the work, since it may be made perfectly straight later on. Overlook any kinks, and do not attempt to straighten the stick by planing more from one side than the other. The chief thing to be done is to fashion a square stick, and when the caliper shows the approximate diameter, draw crosslines at the ends to find the center.

The length of the hand grasp should be marked out. If a double grasp is wanted, allow 12 in. from the butt end. This will afford an 11-in. hand grasp after sawing off the end in which the holes were drilled. For a single hand grasp make an allowance of 11 in. However, the double grasp—with cork above and below the reel seat—is preferred by most anglers because it affords a better grip for the hand when reeling in the line. Mark the hand-

paper—the unprinted back of a strip of wall paper is just the thing—on the bench and drawing two lines from the diameter of the butt to that of the tip. While the caliber of casting rods differs somewhat, the dimensions given will suit the average angler, and I would advise the beginner to make the rod to these measurements. For the butt, draw a line, exactly $\frac{1}{2}$ in. long, across the paper and from the center of this line run a straight pencil mark at right angles to the tip end, or 60 in. distant, at which point another crossline is drawn, exactly $\frac{1}{8}$ in. long, to represent the diameter. Connect the ends of these two crosslines to make a long tapering form. Divide this pattern into eight equal parts, beginning at 12 in. from the butt end, marking a crossline at every 6 in. This layout is shown exaggerated in Fig. 5. If it is desired to copy a certain rod, find the diameter at the several 6-in. stations with the caliper and write them down at the corresponding sections of the paper diagram. However, if a splendid all-around casting



Gauge Made of Sheet Brass Having Slots Corresponding in Length and Width with the Caliper-Layout Measurements

rod is desired, it is perfectly safe to follow the dimensions given in Fig. 5, which show the manner of dividing the paper pattern into the equal parts and the final diameter of the rod at each 6-in. station, or line.

Procure a small strip of thin brass, or zinc, and file nine slots on one edge to correspond in diameter with the width of the horizontal lines which indicate the diameter of the rod on the pattern. This piece is shown in Fig. 6. By making use of the pattern and the brass gauge, the rod may be given the desired taper and the work will proceed more quickly than if the caliper is alone relied upon to repeatedly check up the work.

When a good layout of the work is thus made, the next step is to carefully plane the stick so that it will be evenly tapered in the square. Plane with the grain and from the butt toward the tip end, and make frequent tests with caliper and gauge, noting the diameter every 6 in. Mark all the thick spots with a pencil, and plane lightly to reduce the wood to the proper diameter. Reduce the stick in this manner until all sides have an even taper from the butt to the tip. The stick should now be perfectly square with a nice, even taper. Test it by resting the tip end on the floor and bending it from the butt end. Note the arch it takes and see if it resumes its original shape when the pressure is released. If it does, the elasticity of the material is as it should be, but if it remains bent or takes "set," the wood is very likely to be imperfectly seasoned and the rod should be hung up in a warm closet, or near the kitchen stove, for a few weeks, to season.

To facilitate the work of planing the stick to shape, a length of pine board with a groove in one edge will be found handy. A 5-ft. length of the ordinary tongue-and-groove board, about 1 in. thick, will be just the thing. As the tip of the rod is smaller than the butt, plane the groove in the board to make it gradually shallower to correspond to the taper of the rod. Nail this board, with the groove uppermost, to the edge of the workbench, and place the rod in the groove with one of the square corners up, which can be easily taken off with the finely set plane. Plane off the other three corners in a like manner, transforming

the square stick into one of octagon form. This part of the work should be carefully done, and the stick frequently calipered at each 6-in. mark, to obtain the proper taper. It is important to make each of the eight sides as nearly uniform as the caliper and eye can do it. Set the cutter of the small plane very fine, lay the strip in the groove and plane off the corner the full length of the stick, then turn another corner uppermost and plane it off, and so on, until the stick is almost round and tapering gradually from the mark of the hand grasp to the tip.

To make the rod perfectly round, use the steel scraper in which the grooves were filed and scrape the whole rod to remove any flat or uneven spots, and finish up by sandpapering it down smooth.

The action of the rod differs with the material used, and in trying out the action, it is well to tie on the tip and guides and affix the reel by a string in order to try a few casts. If the action seems about right, give the rod a final smoothing down with No. 0 sandpaper.

For the hand grasp nothing is so good as solid cork, and while hand grasps may be purchased assembled, it is a simple matter to make them. In Fig. 7 are shown four kinds of handles, namely, a wood sleeve, or core, A, bored to fit the butt of the rod and shaped for winding the fishing cord; a built-up cork grasp, B, made by cementing cork washers over a wood sleeve, or directly to the butt of the rod; a cane-wound grip, C, mostly used for salt-water fishing, and the double-wound grip, D, made in one piece, then sawed apart in the center, the forward grip being glued in place after the reel seat is in position.

To make a grip, select a number of cork washers, which may be obtained from dealers in the wholesale drug trade, or from any large fishing-tackle dealer. Make a tool for cutting a hole in their centers from a piece of tubing, or an old ferrule of the required diameter, by filing one edge sharp, then cov-

ering the other end with several thicknesses of cloth. Turn this tube around in the cork like a wad cutter. If the cutter is sharp, a nice clean cut will result, but the opposite will likely oc-

and force the sleeve tightly in place. A day or two should be allowed for the glue to set and thoroughly dry, before giving the hand grasp the final touches.

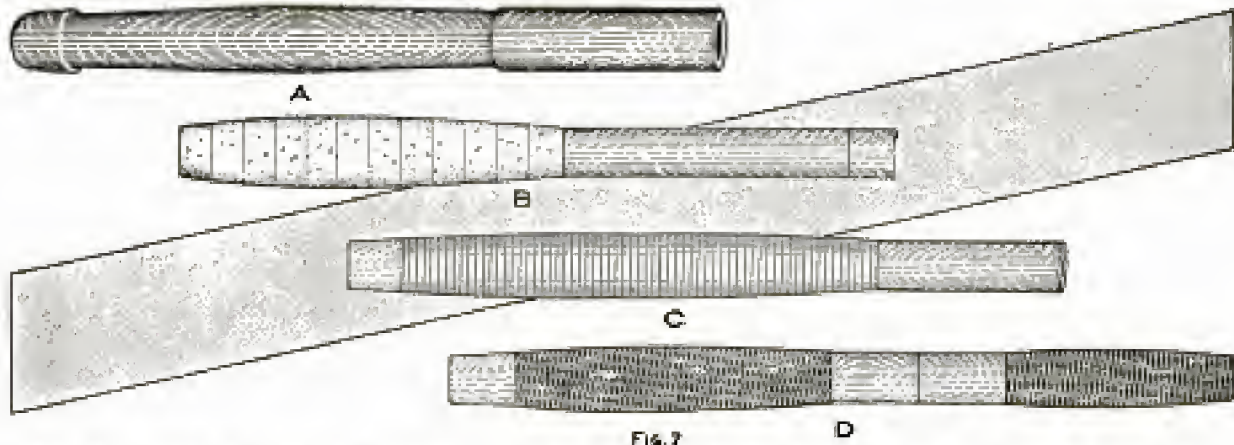


FIG. 7
The Four Different Types of Hand Grasps Are a Wood Sleeve Bored to Fit the Butt of the Rod; the Built-Up Cork over a Wood Sleeve; a Cane-Wound Grasp, and the Double Cord-Wound Grasps with a Reel Seat between Them

cur if an attempt is made to hammer the tube through the cork.

Having cut the butt end of the rod off square, about 1 in. from the end, or enough to remove the holes, smear a little hot glue on the end, drop a cork washer over the tip of the rod and work it down to the butt. Cut another cork, give the first one a coat of glue, slip the former over the tip and press the two together, and so on, until about 10 corks have been glued together in position. This will give a hand grasp a trifle over 5 in. long.

A sleeve will be needed for the reel seat to slip over, and a soft-wood core of this sort can be purchased from any dealer in rod-making materials, or it can be made at home. For the material procure a piece of white pine, about $\frac{3}{4}$ in. in diameter and 5 in. long. A section sawed from a discarded curtain roller will serve the purpose well. Bore a $\frac{1}{2}$ -in. hole through the piece and plane down the outside until it slips inside the reel seat. It should be well made and a good fit, and one end tapered to fit the taper of the reel seat, while the opposite end should be about $\frac{1}{4}$ in. shorter than the reel seat. Slide this wood sleeve down the rod, as shown in Fig. 8, coat the rod and the upper part of the last cork with glue

If a lathe is at hand, the hand grasp may be turned to any desired shape, but most anglers prefer a cylindrical-shaped grip, leaving the top cork untrimmed to form a kind of shoulder when the metal reel seat is pressed into the cork. If corks of $1\frac{1}{4}$ -in. diameter are purchased, but little trimming will be necessary to work the hand grasp down to $1\frac{1}{8}$ in. in diameter. This size seems to fit the average hand about right. The lower corks will need a little trimming to fit the taper of the butt cap so that it may fit snugly in place. Cement the butt cap in place by heating the cap moderately hot, then rub a little of the melted ferrule cement inside the cap, and force it over the cork butt. When the cement has hardened, drive a small brass pin or



FIG. 8
The Corks Glued in Place on the Butt and the Wood Sleeve, or Reel-Seat Core, Ready to Slide Down and Glue in Position

brad through the cap, and file the ends off flush with the metal surface. All the guides, ferrules, and reel seat are shown in Fig. 9.

The regulation metal reel seat is about $4\frac{1}{2}$ in. long, and in fitting it to the old type of bait rod, the covered hood is affixed to the upper end of the reel seat. This arrangement is satisfactory enough for the 9-ft. bait rod, but it is rather awkward in fitting it to the short bait-casting rod, as with the hood at the upper end the reel is pushed so far forward that it leaves 1 in. or more of the reel seat exposed, and the hand must grip this smooth metal instead of the cork. To avoid this, it is best to cut the reel seat down to $3\frac{7}{8}$ in. and affix the reel seat to the rod with the hood at the lower end near the hand. For a single hand grasp, a tapered winding check will be needed to make a neat finish and this should be ordered of the correct diameter to fit the reel seat at the lower end and the diameter of the rod at the other. In the double hand grasp the winding check is used to finish off the upper end of the cork, which is tapering to fit the rod at this point.

In assembling the reel seat, push it with the hooded end well down and work it into the cork to make a tight waterproof joint. Push the reel seat up the rod, coat the sleeve with cement and push the reel seat home. Drive a small pin through the hooded end and reel seat to make the whole rigid. This pin should not be driven through the rod or it will weaken it at this point. Just let it enter the wood a short distance to prevent the reel seat from turning.

The upper or double grasp is fashioned after the reel seat is in position, and the corks are cemented on and pushed tightly together in the same manner as used in forming the lower grasp. The first cork should be pressed tightly against the upper end of the reel seat and turned about so that the metal may enter the cork and form a tight joint. As many corks as are required to form a grip of proper length are in turn cemented to each other and the rod. After the glue has become dry, the cork may be worked down and tapered to make a smooth, swelled grasp. The winding check is now ce-

mented on, to make a neat finish between the upper grip and the rod.

Before affixing the guides, go over the rod with fine sandpaper, then wet the wood to raise the grain, and repeat this operation, using old sandpaper. If an extra-fine polish is wanted, rub it down with powdered pumice and oil, or rottenstone and oil, and finish off with an oiled rag.

To fit the agate tip, file down the end of the rod with a fine-cut file until it is a good fit in the metal tube. Melt a little of the ferrule cement and smear a little on the tip of the rod, then push the agate down in place.

Spar varnish is often used to protect the rod, but extra-light coach varnish gives a better gloss, and it is as durable and waterproof as any varnish. It is only necessary to purchase a quarter pint of the varnish, as a very small quantity is used. The final varnishing is, of course, done after the rod has been wound and the guides are permanently whipped in position. However, it is an excellent idea to fill the pores of the wood by rubbing it over with a cloth saturated in the varnish before the silk whippings are put on. Merely fill the cells of the wood and wipe off all surplus, leaving the rod clean and smooth.

The guides may now be fastened in place, and for the 5-ft. rod, but two of them are necessary. The first guide should be placed $19\frac{1}{2}$ in. from the metal taper which finishes off the upper hand grasp, and the second guide spaced $15\frac{1}{2}$ in. from the first. By spacing the guides in this manner, the line will run through them with the least possible friction.

Winding, or Whipping, the Rod

Before whipping on the guides, take a fine file and round off the sharp edges of the base to prevent the possibility of the silk being cut. Measure off the required distances at which the guides are to be affixed, and fasten them in position by winding with a few turns of common thread. Ordinary silk of No. A size may be used, but No. 00 is the best for small rods. Most anglers

agree that the size of the silk to use for the whippings should be in proportion to the size of the rod—heavy silk

from the spool and tuck the end under the whipping by pulling on the ends of the waxed loop, as shown at G.

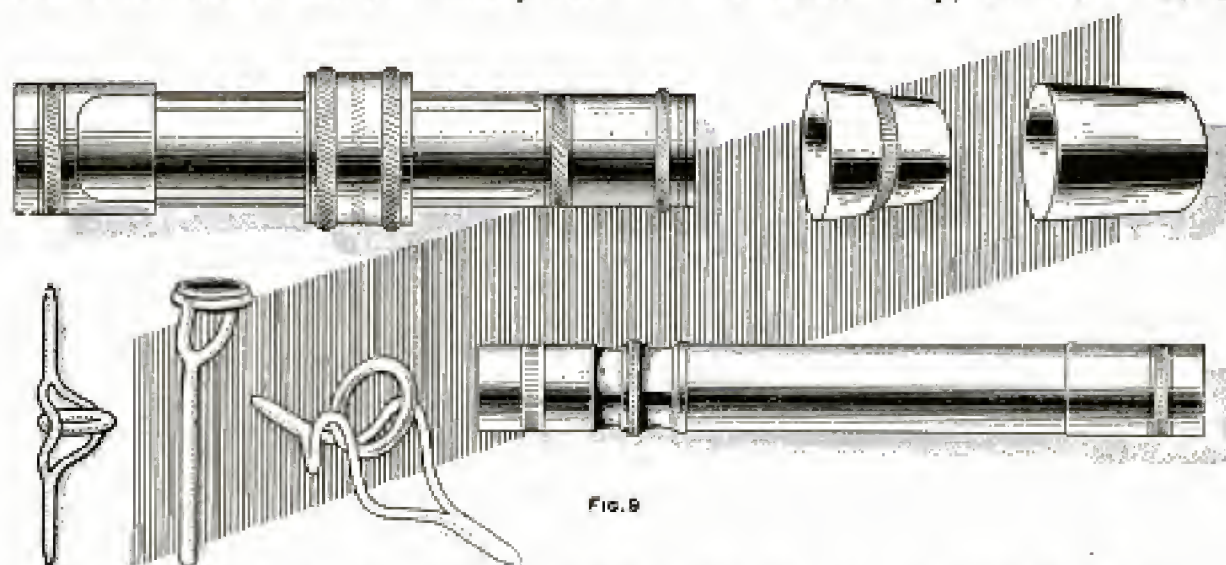


FIG. 9

The Mountings Used on a Bait-Casting Rod Consist of a Reel Seat, Butt Cap, Taper Sleeve, Narrow Agate Guide, Agate Offset Top, One Ring Guide, and a Welled, Shouldered Ferrule

for the heavy rod, and fine silk for the small rod. Size A is the finest silk commonly stocked in the stores, but one or more spools of No. 00 and No. 0 may be ordered from any large dealer in fishing tackle. As a rule, size 0 gives a more workmanlike finish to the butt and joints of fly and bait rods, while No. 00 is about right to use for winding the tips. In fact, all rods weighing up to 6 oz. may be whipped with No. 00 size.

In whipping the rod, the so-called invisible knot is used. Begin the whipping, as shown at E, Fig. 10, by tucking the end under the first coil and holding it with the left thumb. The spool of silk is held in the right hand and the rod is turned to the left, sufficient tension being kept on the silk so that it can be evenly coiled with each strand tightly against the other. A loop of silk, some 4 in. long, is well waxed and placed so that its end will project a short distance beyond the last coil which finishes the whipping. This detail is shown at F. In whipping on guides, begin the whipping at the base and work over the pointed end of the flange, winding on sufficient silk to extend about $\frac{1}{8}$ in. beyond the pointed flange of the guide base. When the last coil is made, cut off the thread

Cut off the ends neatly with a sharp knife.

For colors, bright red and a medium shade of apple green are the best, since these colors keep their original tint after varnishing, and are less likely to fade than the more delicate shades. Red finished off with a narrow circle of green always looks well, and red with yellow is likewise a good combination. Narrow windings look much better than wide whippings, and a dozen turns make about as wide a winding as the angler desires. For edgings, three or four turns of silk are about

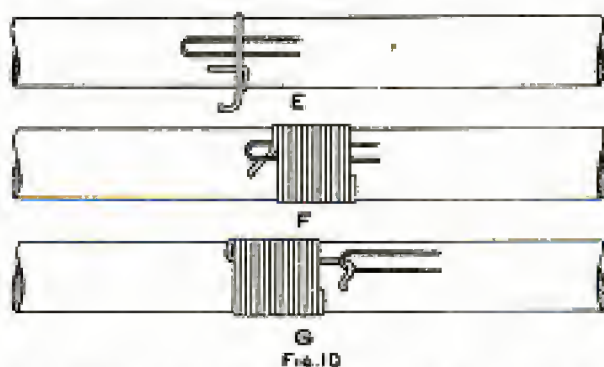


FIG. 10

Both Ends of the Silk Thread are Placed under the Winding to Form an Invisible Knot

right, and these should be put on after the wider windings have been whipped on and in the same manner, although it is best to tuck the ends of the edging

beneath the wider winding when pulling the end through to make the invisible knot.

Varnishing the Rod

After winding the rod, see that all fuzzy ends are neatly clipped off, then go over the silk windings with a coat of shellac. The shellac can be made by dissolving a little white shellac in grain alcohol. Warm the shellac and apply it with a small camel's-hair brush, giving the silk only two light coats. Allow the rod to stand a couple of days for the shellac to become thoroughly dry.

A small camel's-hair brush will be required for the varnishing—one about $\frac{1}{2}$ in. wide will do. If the varnishing is to be done out of doors, a clear and warm day should be selected, and the can of coach varnish should be placed in a pot of hot water for five minutes, so that the varnish will spread evenly.

A temperature of about 75 deg. is best for this work, as the varnish will not spread if cold or in a cold place. The varnish should be evenly brushed on, and care taken that no spots are left untouched. Hang up by the tip to dry in a room free from dust. While the varnish will set in four or five hours, it is a good plan to allow three days for drying between coats. Two coats will suffice to protect the rod, but as coach varnish, properly applied, is rather thin in body, three coats will give complete protection to the wood.

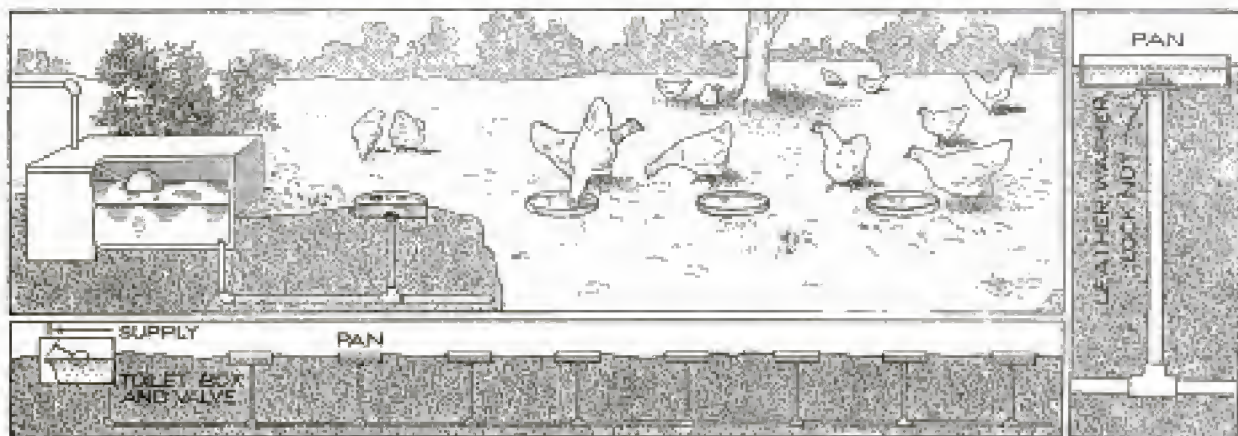
The materials required for this rod are, 1 dagame or greenheart stick, 5 ft. long and $\frac{3}{8}$ in. square; 1 reel seat with straight hood, $\frac{3}{4}$ in.; 1 butt cap, 1 in.; 1 taper, small end $\frac{1}{2}$ in.; 1 offset, or angle, agate top, $\frac{1}{2}$ in., and 2 narrow agate guides, $\frac{1}{2}$ in., all in German silver; 2 doz. corks, $1\frac{1}{4}$ by $1\frac{1}{8}$ in., and two 50-yd. spools of silk, red and green, 00 size.

Automatic Watering System for Poultry Yards

Where a large number of poultry is cared for, the annoyance and attention necessary to furnish a constant water supply can be overcome by using the system shown in the illustration. For this purpose a storage tank must be provided. This may be some old toilet flush tank, or any open reservoir that will hold sufficient water to keep all the drinking pans supplied. A float is provided and connected with a stop

valve, so that when the float drops below a certain level, the valve will be turned open, and a fresh supply of water will enter the storage tank, thereby again raising the float and closing the valve.

Each drinking pan should be about 10 in. in diameter by 4 in. deep, and is drilled for a $\frac{7}{8}$ -in. hole to fit a $\frac{1}{2}$ -in. pipe. At the pan end, the pipe is threaded so that a lock nut and leather washer can be attached on each side of the pan bottom, to provide a water-tight joint; at the other end, the pipe



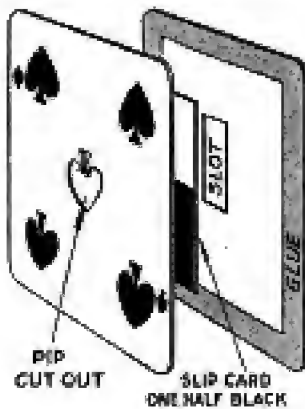
Simple Arrangement of a Flush Tank in Connection with a System of Pipes to Supply One or More Pans of Water for the Poultry Yard

is screwed into a tee in the $\frac{1}{2}$ -in. main line which connects with the storage tank.

In using the system, sufficient water is run into the tank to fill the pans about three-quarters full. The float may then be adjusted to a shut-off position for the inlet valve. All pans are automatically kept at one level, even though several may be used considerably more than others. When the general water level has dropped sufficiently, the float, dropping with it, will open the stop valve, and cause the water to enter the tank and pans until the original level is again restored.—Contributed by D. E. Hall, Hadlyme, Connecticut.

Changing Pip on a Card

Cut out the center pip on the five-spot of spades with a sharp knife. Cut a slot centrally in another card, about $\frac{3}{8}$ in. wide and $1\frac{1}{4}$ in. long. Glue the surfaces of both cards together near the edges to form a pocket for a slide, which is cut from another card and has one-half of its surface colored black. A drop of sealing wax attached to the back of the sliding part, so that it projects through the slot, provides a means of moving the slide in the pocket. A lightning change can be made from a five-spot to a four-spot while swinging the card.



To Make a Special Envelope

Any size of envelope for mailing special papers or documents can be made as follows: All envelopes are of the same shape as shown in Fig. 1; the size for the papers to be inclosed is represented by the dotted lines in Fig. 2. The projections A are coated with

paste, and the flap B is folded over them. The envelope is then ready for the inclosure. The flap C is pasted and

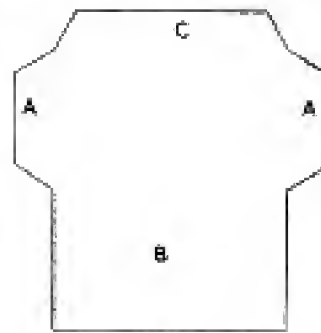


Fig. 1

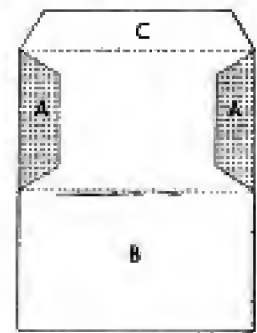


Fig. 2



Fig. 3



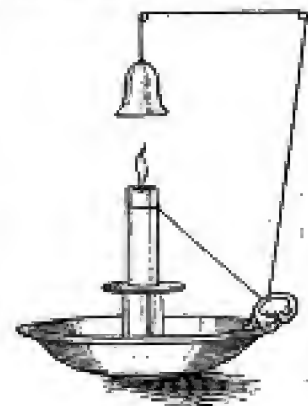
Fig. 4

Various Stages in the Forming of an Envelope to Make Any Size for Special Papers

folded over as with an ordinary envelope.—Contributed by L. E. Turner, New York City.

Automatically Extinguishing a Candle

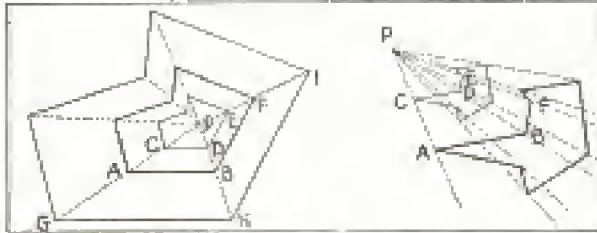
Candles can be easily fitted with attachments to extinguish the light at a set time. To determine the length of time, it is necessary to mark a candle of the size used and time how long a certain length of it will burn. Then it is sufficient to suspend a small metal dome, or cap, to which a string is attached, di-



rectly over the flame, and run the opposite end of the string over nails or through screw eyes, so that it can be tied around the candle such a distance from the flame end, that the part between the flame and the string will be consumed in the time desired for the light to burn. When this point is reached, the string slips off the candle, and the cap drops on the flame.

To Enlarge or Reduce Plots

Sometimes it is necessary to enlarge or reduce a plot to a different scale. This can be easily and quickly accom-



Enlarging and Reducing Plots by Radial Lines from a Common Point Located Properly

plished without resorting to the slow process of protracting the angles and scaling the individual lines.

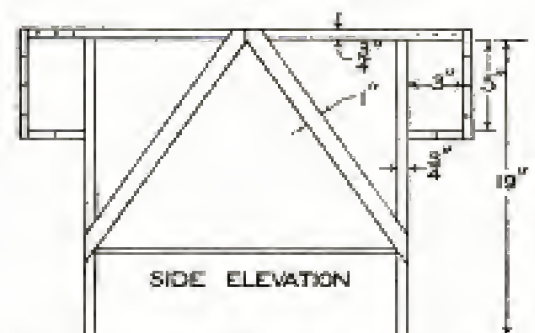
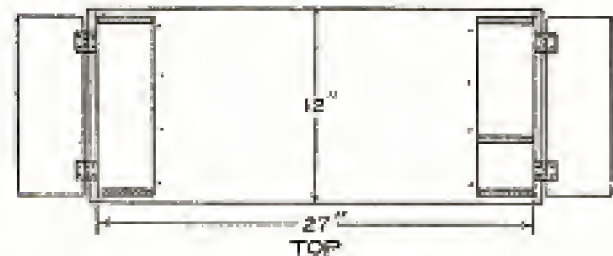
Take any point, P, and from it draw light pencil lines through each of the corners of the plot. On any one of these lines, as AP, lay off with dividers AC equal to CP. Place a triangle on the line AB and with a straightedge, or another triangle, laid on the line AP, slide the former to the point C, then draw line CD parallel with AB until it intersects the radial line PB. In the same manner draw line DE parallel with BF, and so on, all about the plot. A test of accuracy will be in striking the point C with the last line. If the original plot has a scale of 40 ft. to the inch the reduced plot would be 80 ft. to the inch. If it is required to enlarge the plot to 20 ft. to the inch, make AG equal to AP, and proceed as in the first case, using G as the starting point.

The location of the point P is

arbitrary and may be outside of the boundary of the plot or figure to be enlarged or reduced, but should be so located, if possible, that the radial line to any corner does not parallel either of the plot lines to that corner. If the point cannot be so located for all the lines, it may be necessary to scale the lines. A little practice in picking out the best location for the point will give gratifying results. — Contributed by Junius D. McCabe, Pittsburgh, Pa.

A Lathe Bench

While working at a bench, or foot-power lathe, it is quite convenient to have some sort of a seat to sit on while at work, or between operations. In making such a seat, I used a board, 27 in. long and 12 in. wide, for the top, and two boards, 19 in. long and 12 in. wide, for the supports. These boards were $\frac{3}{4}$ in. thick. The supports were squared at the ends and securely fastened to the top with nails, their positions being 3 in. in from the ends of the top board. These were well braced, as shown, and a cross board



The Bench Provides a Seat for the Worker in Doing Operations on a Small Foot Lathe

was placed between them, near the lower ends.

The projecting ends of the top were cut out, and a box, 5 in. deep, constructed against the supports. A

covering was made to fit in each of the openings in the top board and hinged to the outer edge of the box. The boxes made a convenient place for the tools used in the turning work.—Contributed by Harold R. Harvey, Buhl, Idaho.

Cleaning and Polishing Shoes

In using the polishes now on the market for tan shoes, I found that the leather cracked in an unreasonably short time. The following was suggested and tried out with good results. Wash the shoes with castile soap and water by applying the mixture with a dauber. Work up a little lather and then rub dry with a cloth, without rinsing. The leather will be cleaned without becoming dark, and it will not crack. A higher polish may be obtained by using some paste polish in the usual manner.—Contributed by George Bliss, Washington, D. C.

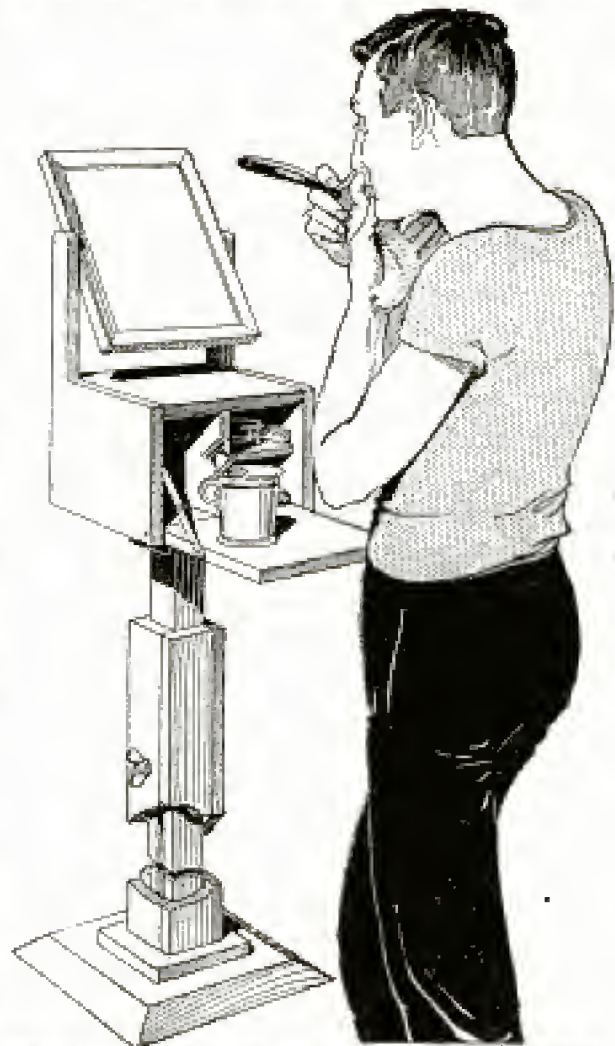
Shaving Cabinet Mounted on an Adjustable Pedestal

The illustration represents a shaving cabinet mounted on an adjustable pedestal, whose style and size are such that it may easily be moved about or set away without requiring much room. The material required for its construction is as follows:

- 1 framed mirror, 8 by 10 in.
 - 1 square-head bolt and wing nut, $\frac{1}{2}$ by 4 in.
 - 2 cabinet sides, $\frac{1}{2}$ by 7 by 15 in.
 - 2 partitions and shelf, $\frac{1}{2}$ by 6 by 6 in.
 - 1 cabinet top, $\frac{1}{4}$ by 7 by 10 $\frac{1}{2}$ in.
 - 1 cabinet bottom, $\frac{1}{2}$ by 6 by 10 $\frac{1}{2}$ in.
 - 2 cabinet backs and doors, $\frac{1}{2}$ by 6 $\frac{1}{2}$ by 10 $\frac{1}{2}$ in.
 - 4 cabinet moldings, 1 by 4 by 4 in.
 - 1 cabinet support, 2 by 2 by 26 in.
 - 4 pedestal moldings, 1 by 1 by 6 in.
 - 4 pedestal frames, 1 by 3 by 36 in.
 - 1 base, 2 by 12 by 12 in.
- Screws, nails, and varnish.

The sidepieces of the cabinet are extended at one corner, thereby forming the supports for the mirror. The door fits in between the sides and may be attached either by hinges or two wood screws, one on each side, holes being bored in the sides forming a loose fit for the screw so they can freely turn with the door. The pedestal consists of a 4-in. square box resting on the base block, and secured in place by

means of molding strips. The sliding support for the cabinet consists of a 2-in. square piece secured to the bot-



The Mirror and Cabinet are Mounted on a Pedestal That can be Moved as Desired

tom of the cabinet by means of molding, and provided with a slot so the support can freely slide over the clamp bolt, which fastens it in place by clamping it against the pedestal. If it is desired to conceal the head of the bolt, a recess should be made in the pedestal frame for it, as shown, so the support will freely slide over it. Before assembling the pedestal it will be necessary to drill a hole in the front side in line with the recess of the back side, and insert the bolt. If this precaution is not taken, it will not be possible to insert the bolt, unless a hole be made for the head either through the back side or front side.—Contributed by D. Toppan, Watervliet, N. Y.

INTERESTING NEW PATENTS

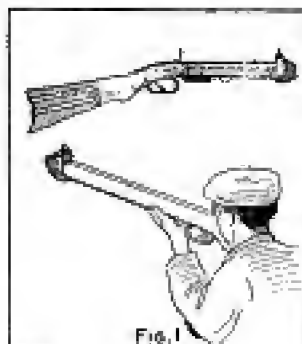


Fig. 1

GUN CAMERA (Fig. 1)—This curious camera is aimed in the same manner as a gun and is operated by the trigger. At the muzzle end of the barrel are the camera, film holder, and shutters. When the trigger is drawn back, the bulb within the breech is compressed, and the resulting action is exactly like that of an ordinary camera operated with a bulb and tube.



Fig. 2

COMBINED WASHTUB AND WASHBOARD (Fig. 2)—This washtub has a wall formed of a single piece of metal inclined outwardly, as shown. It is much like an ordinary metal washtub except that a portion of the wall is made straight, and is provided with the corrugations necessary for forming a washboard.

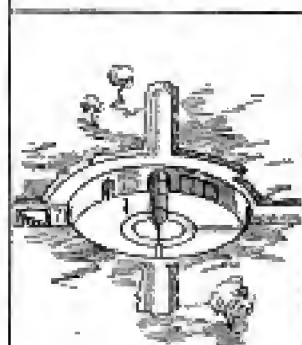


Fig. 3

RUBBER OVERSOLE (Fig. 3)—This device consists of a thick cushion of rubber designed to be fitted over the sole of the shoe. It is made with a recess and flange to fit over the edge of the sole, and is further held securely in place by hooks.

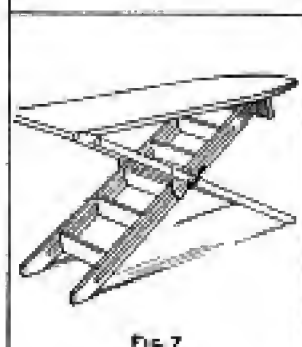


Fig. 4

MACHINE FOR CLEANING WINDOWS AND WALLS (Fig. 4)—The principal purpose of this machine is to permit the window cleaner to clean the outside of a window without climbing out on the window ledge. The cleaning brush is carried at the end of a collapsible shaft, and is rotated by a crank arm within the building. The whole device is easily clamped to the window ledge, while the brush is moved about as required by means of the controlling lever.

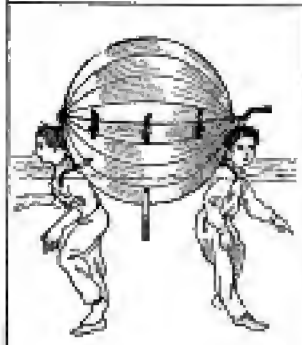


Fig. 5

UNDERGROUND AIRSHIP SHELTER (Fig. 5; British patent to a German)—The central circular space is an open excavation in the center of which is a turntable. Opening into this excavation are underground shelters as well as a passageway connecting with the surface of the ground. Each shelter is closed with a sliding door. The airships are received on a car that runs on rails, the wheels being so arranged as to grip the rails against the lifting impulse of the airship.



Fig. 6

DOOR HOLDER AND BUFFER (Fig. 6)—This buffer is made of one strip of metal, one end being bent to the form of a vertical stop and the other to the form of an inclined spring that acts against the bottom of the door. The device is designed to lie flat on the floor and to hold the door in any position.



Fig. 7

COMBINATION STEPLADDER AND IRONING BOARD (Fig. 7)—This device is made to be used as an ironing board when placed in the position shown, or as a stepladder when stood on end. When used as a stepladder, the supporting ends are spread apart as far as the chains connecting the sliding sidepieces and the ladder portion will permit.



Fig. 8

HOLDER FOR EAR CORN (Fig. 8)—The end plates of this curious device may be adjusted to any length of ear by means of the ratchet teeth and slots at the connection of the rods at the bottom. Two toothed heads hold the ear securely when the parts are drawn against the ends of the ear, while the journaled mountings permit free rotation.

Fig. 9

SPHERICAL LIFE PRESERVER (Fig. 9)—The feature about this invention is that it can easily be folded compactly, or opened out to spherical form by the rotation of the handle, which operates a series of semicircular ribs on which the air-tight covering is mounted. The user is supported by shoulder straps as shown. Fastenings are provided for holding the life preserver in spherical shape, and when secured in this way it is air-tight.

Fig. 10

COLLAPSIBLE DRINKING CUP (Fig. 10)—The two halves are pivoted together at the top, as shown. When opened out, the parts form a conical drinking cup, but take a flat form when one of the halves is rotated over the other.



Fig. 11

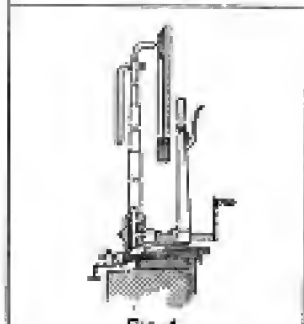


Fig. 12

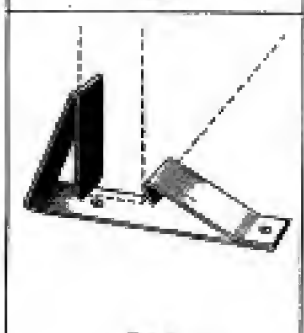


Fig. 13



Fig. 14

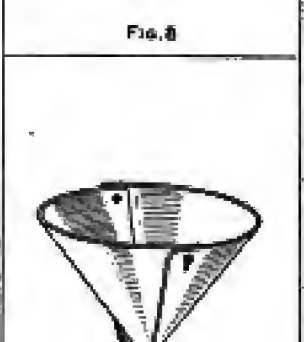


Fig. 15

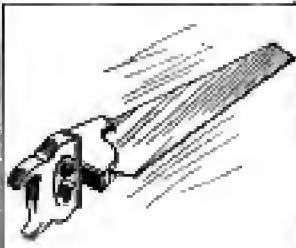


Fig. 11



Fig. 12



Fig. 13



Fig. 14

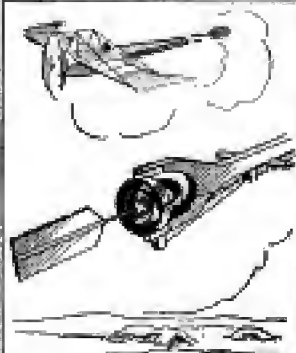


Fig. 15



Fig. 16

SAW HANDLE (Fig. 11)—The interesting feature of this invention is that the handle can be rotated to any angle with reference to the saw blade and fixed in that position. The blade holder has a flat surface, and against this the flat surface of the handle works. The handle is fixed in position by a clamping nut, as shown.

EMERGENCY WHEEL FOR VEHICLES (Fig. 12)—This is simply a two-wheeled truck intended to support temporarily the axle of a vehicle when a wheel has been broken. The wheels of the truck are of the caster type and support the truck frame by means of vertical spindles. The curved tongue projecting forward from the truck is strapped to the frame of the vehicle.

REPEATING DEVICE FOR PHONOGRAPHS (Fig. 13)—This device consists of a spiral track that rotates with the record table, and is so shaped that it lifts the sound box as it reaches the inner edge of the record, transports it across the record, and then lets it down on the outer edge. This is accomplished by curving the inner end of the track downward so that it runs under the sound box when it reaches the inner edge of the record. One turn of the track transports the sound box back to the outer edge, where it is let down gently through the action of a flexible end. While the record is being played, the track rotates above the sound box.

YIELDING FENDER FOR SHIPS (Fig. 14)—The object of this invention is to provide a fender that will yield under the impact of a collision and protect the ship from damage by absorbing the shock gradually. The fender consists of hinged sections which are held out from the hull by pivoted links, the point being normally thrust out from the bow by a plunger. A worm gear and an air cushion cause this plunger to retard the deflection of the fender when force is brought to bear against the point.

TIRE PUMP WORKED BY MOTION OF WHEEL (Fig. 15; British patent to an Austrian)—With this device the power of the revolving wheel is used for inflating the tire. The pump is attached to the hub and revolves with the wheel, and is operated by a lever arm connected by levers and links with the pump piston. The compression stroke is brought about when this lever arm strikes a lug on the vehicle frame. As soon as the lever arm clears the lug, it is brought back to its original position by a spring.

HEDGE TRIMMER (Fig. 16)—The purpose of this invention is to provide a hedge-trimming machine that works much like a mowing machine. The teeth work between guards, as shown, and are drawn back and forth by a small wheel in the handle. This wheel is rotated through a flexible shaft by hand power, or electric power. Adjustments are provided for giving the trimmer a curved form.

LIFE-SAVING APPARATUS (Fig. 17)—The body portion of this life preserver floats horizontally on the surface of the water. At one end is a hood made up of hinged sections, which may be opened or closed to suit the comfort of the user.

SCAFFOLD FOR USE IN FELLING TREES (Fig. 18)—This scaffold is designed to support the workman at any desired level when a high stump is to be left. It consists of a collapsible frame which is easily attached to the tree trunk, and on which is held a plank for supporting the workman.

STEERING APPARATUS FOR AIR CRAFT (Fig. 19; American patent to a Canadian)—The steering gear is mounted in a forked-tail frame and has two movements, as shown. The rudder can be swung horizontally or can be rotated on its shaft to any angle.

NONSINKABLE SHIP (Fig. 20)—The ship is provided with side extensions in which are air containers. The air containers are separated by bulkheads, so that if one is punctured it does not affect the others.

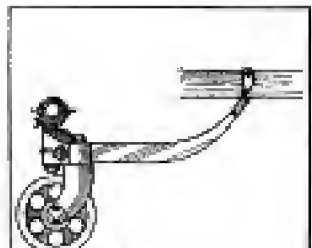


Fig. 12

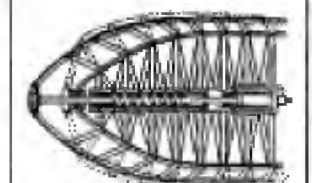


Fig. 13

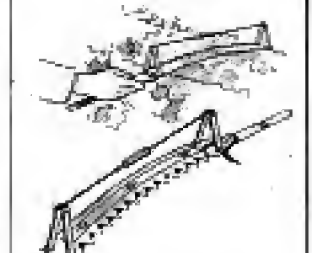


Fig. 14



Fig. 15

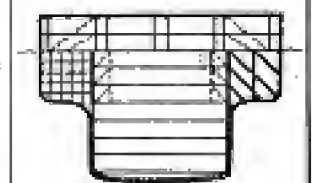


Fig. 16

5656 Ernest C. Redstone
25 Arch St., Boston, Mass.

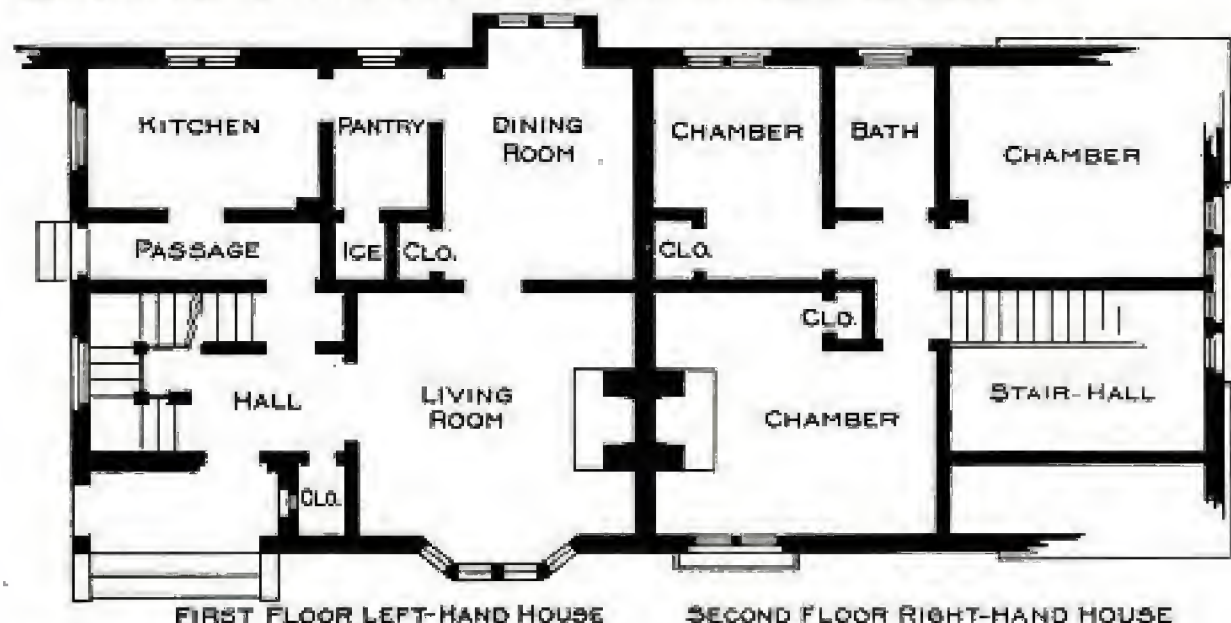
PICTURESQUE TWIN HOUSE OF MODERATE COST



ERNEST C. REDSTONE, ARCHITECT, BOSTON, MASS.

THIS picturesque twin house contains six rooms on each side in addition to hall, passage, and pantry, on the first floor, and stair hall and bathroom, on the second floor. The cost of the house is about \$9,000, a figure that includes heating, plumbing, and electric wiring. The walls are built of hollow tile and are faced with gray pebble-dashed stucco. The color scheme of the exterior has been carefully studied to produce a subdued and harmonious effect. The exterior trim is dark brown, the window blinds and flower boxes are dark green, and the tin flashing of the roof is verdigris. The entire building is 54 ft. long and 24 ft. wide. The ceiling height is 8 ft. in both stories and basement. The two halves of the building are the same, except for the necessary reverse in the arrangement of the rooms.

The living room on each side has a beamed ceiling and is provided with a brick fireplace built into the dividing wall. A door leads from this room directly to the dining room, while access from the kitchen to the dining room is through the pantry. The stairway leading to the second floor is placed in the entrance hall. On this floor, there are three chambers and bath, all of which are conveniently arranged with reference to the stairway.



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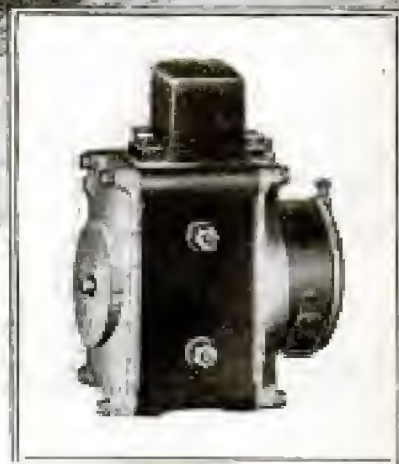
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any new or used Model "T" Ford Car. He can install it while he is getting your car ready for a busy spring.

During 1915 we will produce 100,000 Ford Systems, but contracts already signed by automobile supply dealers call for so many thousands of these systems that it is doubtful if we can meet the total demand.

Early spring is but a few weeks away. This matter calls for your immediate consideration. May we send our "Ford" catalog?

What the System Comprises

THIS Ford System is simple, compact, light in weight, and can be quickly and easily installed on any new or used Model T.

A 6-volt battery, battery box, switches, wiring and all necessary connections are included.

Below we print a list of our distributors. Your local supply man, dealer or agent can secure delivery for you by ordering from the nearest distributor.

GRAY & DAVIS

STARTING - LIGHTING SYSTEM

FOR Ford CARS

Price Complete **\$75** F. O. B. Boston

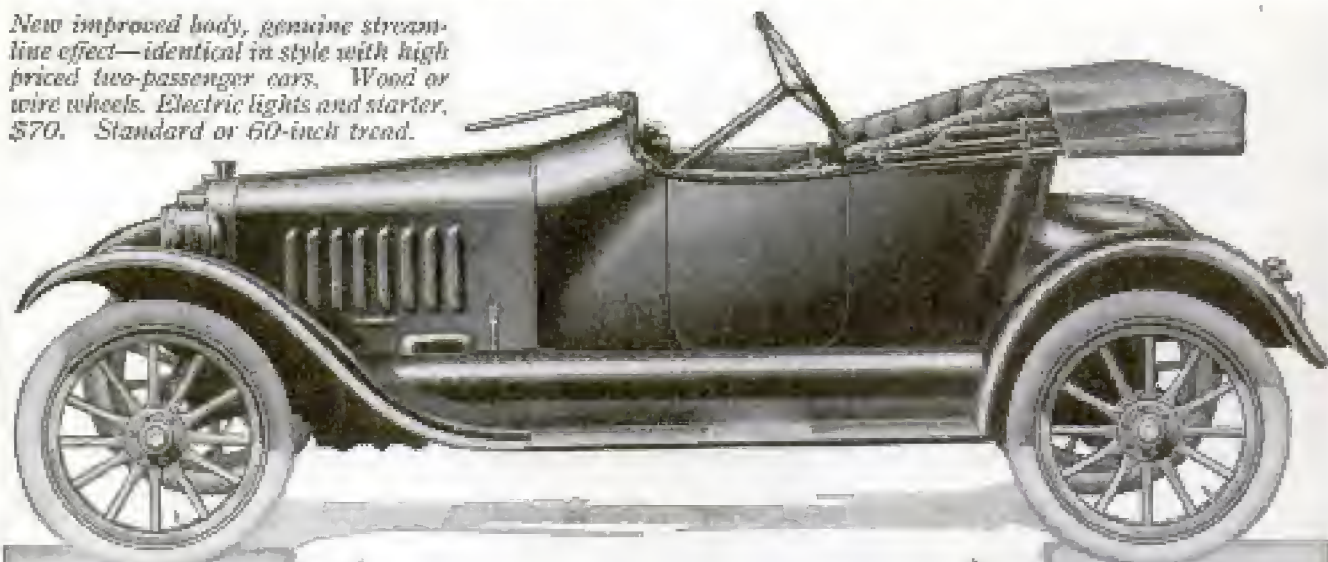
DISTRIBUTORS

Denver, Colo.....Arden Equipment Co.	Detroit, Mich.....P. F. Holmes Co.	Cincinnati, Ohio.....Coughlin & Davis, Inc.
Honolulu, Chan.....K. R. Ashwell	Minneapolis, Minn.....Electric Mfg. Co.	Cleveland, Ohio.....
Washington, D. C.....	St. Paul, Minn.....Electric Mfg. Co.Pennsylvania Rubber & Supply Co.
.....Miller Bros. Auto & Sup. House	Kansas City, Mo. Kansas City Auto Sup. Co.	Columbus, Ohio.....Rogers Supply & Tire Co.
Atlanta, Ga.....Wiley-Armistead Co.	St. Louis, Mo.....Fred Campbell	Toledo, Ohio.....Holzer-Tuley Auto Co.
Chicago, Ill.....Keweenaw & Co.	Ogden, Neb.....Powell Supply Co.	Oklahoma City, Okla. Hurst-Smith Sup. Co.
Indianapolis, Ind.....Gilson Automobile Co.	Buffalo, N. Y.....Jas. G. Barclay, Inc.	Philadelphia, Pa.....J. H. McCullough & Son
Des Moines, Iowa.....Herding Motor Co.	New York, N. Y. Gray & Davis, Inc., Branch	Pittsburgh, Pa.....Jas. Wardwell & Co.
Louisville, Ky.....Roy E. Warner Co.	248-250 West 58th St.	Providence, R. I. Providence Auto Equip. Co.
New Orleans, La.....Interstate Electric Co.	Rochester, N. Y.....Barclay-Brown Co., Inc.	Dallas, Tex.....Perry-Dunlap Auto Supply Co.
Boston, Mass.....Mitchell & Smith, Inc.	Wellington, N. Z.....Colonial Motor Co.	Richmond, Va.....Kocher Motor Car Co.

Pacific Coast Representatives, Hughson & Merton—San Francisco, Los Angeles, Portland and Seattle

GRAY & DAVIS, Inc., BOSTON, MASS.

New improved body, genuine stream-line effect—identical in style with high priced two-passenger cars. Wood or wire wheels. Electric lights and starter, \$70. Standard or 60-inch tread.



\$395

What it
Costs to
OWN
One

SAXON

The car that makes
both ends meet

$\frac{1}{2}$ cent
per Mile

What it
Costs to
RUN
One

The Saxon has removed the last objection anyone ever had to owning an automobile—the *price* reason.

For the *first cost* of the Saxon *places* this sturdy car within reach of everyone. Its price is \$395.

And the *after cost* of the Saxon *keeps* it within the means of everyone. Owners are amazed at the economy records of their Saxons—28 to 36 miles per gallon of gasoline; 75 to 100 miles per pint of oil; 3500 to 5000 miles on a set of tires. Saxons average half a cent a mile in operation cost—one-fourth of a cent per mile per passenger.

And the Saxon *stands up*. It endures the hardest kind of usage without flinching. Many thousands of Saxons now in use all over the United States, in Canada, and in foreign countries have proved the sterling goodness of Saxon construction.

How We Can Do It

Some folks wonder how we can possibly build for \$395 a car that will do the things a Saxon will do. *Good design* is the answer—knowing how—having the right idea of what a light car should be and do, and then figuring

out the best way to get these results at the lowest cost consistent with quality.

Our engineers had at their disposal all that has been learned about automobile building. They started from the beginning to design a light car for economical manufacture and upkeep. They adopted nothing freakish, but they found new ways to use many standard features. They also were first to use some brand new things of proved efficiency.

By taking thought, we are able to offer for \$395 a better automobile than could be bought only a few years ago for five times the price. Saxon is the *modern* car.

A year ago some might have called the Saxon "an experiment." But not today. It *has made good*.

Saxon "Six" \$785

For those who want a touring car, this 3-passenger six-cylinder Saxon is truly an unusual value. It is generously roomy—in no sense a small car. It has a 112-inch wheelbase, 32 x 3½ inch tires, 30-35 horsepower, high speed motor, electric lights and starter as regular equipment, and many other unexpected features. And the price, too, is unexpected—\$785, fully equipped.

Write today for current issue of "Saxon Days" and name of your nearest dealer. Address Dept. J.

Saxon Motor Company, Detroit





Home Billiards

Turns Years Backward!



"Baby Grand"
Pocket Style

This princely sport—like some good fairy godmother—is helping men and women to outwit old age!

In thousands of homes that now have Brunswick Carom and Pocket Tables, the mothers and fathers and sons and daughters are chums.

Each evening there are lively doings in the billiard room. Each round of hand-clapping proclaims a brilliant shot—each burst of laughter another innocent trick that billiards has played on some unlucky member of the party.

Bless *your* home with billiards! Let all the family—and *your* guests—share in the golden hours of youth it brings.

Superb BRUNSWICK Home BILLIARD TABLES

Real Brunswick regulation tables, modified only in size and design. Fast Monarch cushions, accurate angles, slate bed, speed, life and durability.

"Grand" and "Baby Grand"

The finest and fastest home tables in the world. Beautiful mahogany, richly inlaid. Equipped, if desired, with interchangeable cushions, giving two perfect tables in one—for all games of Carom or Pocket Billiards.

Also "Convertible" models that serve as perfect Library or Dining Tables when not in use for Billiards.

30-Day Trial—Outfit FREE

We give with each table complete high class Playing Outfit—Balls, Cues, Rack, Markers, Brush, Tips, Cue-Clamps, expert book on "How to Play," etc. And you may try any Brunswick 30 days in your Home!

20 Cents a Day!

Pay us a little each month for a year. Thousands are buying like this; terms low as 20c a day!

Get our beautiful new book—"Billiards—The Home Magnet"—and see these tables in actual colors. Full descriptions, prices, terms, etc., included. Send the coupon *Now*.

Mail For Billiard Book FREE

The Brunswick-Balke-Collender Co.
Dept. 11M, 623-633 S. Wabash Ave., Chicago

Send postpaid, free, color-illustrated book—

"Billiards—The Home Magnet"
and details of your 30-day Home Trial Offer.

Name

Address

(396)

Please Mention Popular Mechanics



Creating a New Art

At the Centennial Exhibition at Philadelphia, the exhibit of the Bell System consisted of two telephones capable of talking from one part of the room to another.

Faint as the transmission of speech then was, it became at once the marvel of all the world, causing scientists, as well as laymen, to exclaim with wonder.

Starting with only these feeble instruments, the Bell Company, by persistent study, incessant experimentation and the expenditure of immense sums of money, has created a new art, inventing, developing and perfecting; making improvements great and small in telephones, transmitter, lines, cables, switchboards and every other piece of apparatus and plant required for the transmission of speech.

As the culmination of all this, the Bell exhibit at the Panama-Pacific Exposition marks the completion of a Trans-continental Telephone line three thousand four hundred miles long, joining the Atlantic and the Pacific and carrying the human voice instantly and distinctly between New York and San Francisco.

This telephone line is part of the Bell System of twenty-one million miles of wire connecting nine million telephone stations located everywhere throughout the United States.

Composing this System, are the American Telephone and Telegraph Company and Associated Companies, and connecting companies, giving to one hundred million people Universal Service unparalleled among the nations of the earth.

**AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES**

One Policy

One System

Universal Service

Keep the Wolf From YOUR Door

AS long as you are well you know you will pay your way; but if from a clear sky there falls upon you some accident, or some illness, where will you be? Then it will be too late. *Now is the time to be careful.*

Send this coupon — it will be your first step on the road to safety. Typhoid and pneumonia and grippe come to the strongest without warning. One man in seven dies or is injured from an accident every year.



AETNA-IZE

Take out this *Accumulative Disability* Policy. It protects your wife against your death—it protects you against accident—and sickness, too.

Consider this: out of 128,000 claims paid by the Aetna—24,000 were for falls—4,000 for burns and scalds—5,800 for cuts with edged tools or glass—5,000 for crushed fingers—4,000 for stepping on nails or glass—hundreds for tripping over mats or rugs, for splinters in hands or feet and for crushed toes—2,500 for blood poisoning. Every step you take you are liable to some such accident as these.

We Pay You Up To \$50 a Week

If you are engaged in a "Preferred" occupation, and under 60, all it will cost you is \$60 a year. For that small sum—we will pay you \$25 a week as long as you live, if you are disabled by an ordinary accident, or \$50 a week if disabled by a railway, steamship, or burning building accident.

Half the above for partial disability.

And we will pay you \$25 a week up to fifty-two weeks if you are sick. We will pay hospital charges or for a surgical operation.

If you are killed in an accident, if you lose two limbs or both eyes, we will pay from \$5,000 to \$15,000. Half as much for loss of one hand, foot or eye.

There is one sure way to keep the Wolf from your door—that is to send this coupon today. It costs you nothing—it binds you to nothing. **SEND IT RIGHT NOW!**

AETNA LIFE INSURANCE COMPANY
Drawer 1341 HARTFORD, CONN.

The largest company in the world writing Life, Accident, Health and Liability Insurance

Agency opportunities for all Casualty and Bonding lines

Name _____ P.M. 215

Occupation _____

Bus. Address _____

AETNA LIFE INSURANCE COMPANY

Drawer 1341

I have marked the kinds of insurance I want to know about: Accident, C. Health, C. Disability, C. Life, C. Sickness. My age is _____ years. I am in good health.

Please Mention Popular Mechanics

HARTMAN Will Trust You

Remarkable Bargains Never Before Equaled

More than ever before you owe it to yourself and family to get acquainted with the startling Hartman values in Furniture, Carpets, Rugs, Silverware, Draperies, Clocks, Stoves, Refrigerators, Sewing Machines, Jewelry, Washing Machines, Bedding, Curtains, etc., which as the largest home-furnishing concern in the world our \$10,000,000 purchasing power enables us to buy in such immense quantities that we secure the best the market affords, at absolutely rock bottom prices.

Your Credit Good Pay A Little At A Time

We ship dependable home-furnishing goods to more than a million customers year after year, in every part of this country. The plan has proven so satisfactory that we say to you—"Your credit is good, no matter where you live, no matter how small your income; order what you need, pay a little every month. We require no references, ask no embarrassing questions, charge no interest, ask no security." Most liberal and satisfactory credit plan ever devised.

Don't Miss These Wonderful Get-Acquainted Bargains

The Hartman Company alone has such unbounded confidence in its goods that it offers to send to any reader of this publication any one of the remarkable get-acquainted bargains in this advertisement—and that without asking you to send any money in advance. But at these prices we can afford to send but one to each family. Order any one you wish from this advertisement; when you get our mammoth catalog, order any amount you desire.

Every Hartman Bargain Sells On Its Merits

Read our guarantee: "We guarantee to ship each and every article on approval and if within thirty days from receipt of the goods anything is not perfectly satisfactory, for any reason whatever, we will accept their return and when the goods are returned to us, we will refund all moneys paid on them, including payment of freight both ways."

FREE HARTMAN'S MAMMOTH CATALOG

This is the most interesting Home-furnishing Catalog you have ever seen. Hundreds of pages done in beautiful colors. You need a copy. Send your name and address on postal today and receive a copy absolutely free, prepaid.

HARTMAN

Furniture & Carpet Co.,
3845 Wentworth Ave., Chicago, Ill.

No Reference Is Required

Comfortable Rocker Bargain No. MH110.

Large, comfortable Rocker at bargain price. Solid oak, golden finish, choice design. Is upholstered with "Imperial" Spanish brown leather seat and back. Seat has springs, stuffed with tow and cotton. Front and back posts handsomely carved. Seat front plaited and back is button tufted. Strong posts and runners. The best rocker value ever offered at the low price of

\$3.45



50c
Per Month

Collapsible Go-Cart

No. MH122. One motion collapsible Go-cart, equipped with large convenient automobile hood with roll-up side curtains, large footwell, padded seat, two position reclining back, 10-inch wheels with 15 inch rubber tires, nickel fenders, heavy push rods and cross handle. Covering is of "Imperial" leather. Cart is of all steel construction and can be ordered with Black, Green or Brown covering. Price.....\$8.38 75c Per Month



No.
MH
105.

Washing Machine

Bargain 3-shaft capacity, made of Louisiana red cypress, corrugated on inside. Finished natural color. Four precast 10 in. cypress dasher block, cannot slip or crack. Gearing is durable; roller bearings, easy to run. Tub supported by 8 legs which bolt into iron sockets. Don't tear clothes. Price.....\$4.50 50c Per Month

Lawn Swing Bargain

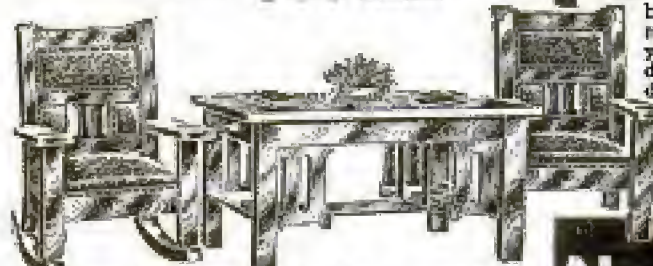
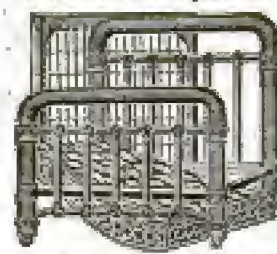
No. MH127. This delightful hardwood Lawn Swing holds four passengers and is exceptionally well-made and durable. Posts are painted red and swing operates freely and noiselessly. Remarkable bargain at our price. \$4.65

50c Per Month

2-Inch Post Steel Bed Outfit

No. MH123. Complete bed outfit bargain, consisting of elegant 2-inch continuous post steel bed with heavy fillers in artistic design, 68 inches high link fabric steel frame bed spring, and cotton top fibre filled mattress. Outfit comes in all sizes: 3 ft. 3 in. x 6 in.; 4 ft. x 6 in. (full size). Colors: White, Tan, Green or Varnish Martin.

Our price only \$9.77 75c Per Month



Three-Piece Mission Set Bargain

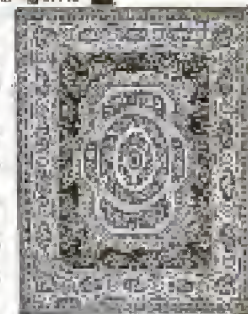
No. MH109. Solid oak, fumed finish, 3-piece Mission Set. Table 24x4 inches, strongly built; convenient back shelf at either end. Rocker and Arm Chair made to match; upper and outside panels upholstered with "Imperial" Spanish leather; seat set on 4 springs, expertly filled and upholstered. Price.....\$11.78 75c Per Month

No Money In Advance

Brussels Rug Bargain

No. MH125 Beautiful Brussels Rug in 4 sizes. Design is very charming; best medallion center; conventional border. Colors: Tan, Green, Brown, Red and light colorings. This is a great opportunity to get a magnificent rug for little money. Size, 6 ft. 9 in. x 9 ft. Price.....\$6.85
Size, 8 ft. 3 in. x 10 ft. 6 in. Price.....\$8.95
Size, 9x12 ft. Price.....\$10.75

75c Per Month
Size, 10 ft. 6 in. x 13 ft. 6 in. Price.....\$16.50



\$1.25 Per Month





TYPEWRITER SENSATION

Free TRIAL—Use As You Pay

Only \$3.00 a month until the low total price of \$48.30 is paid, and the machine is yours

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay \$3.00 a month and own one. Think of it—Buying a \$100.00 machine for \$48.30. Cash price, \$45.45. Never before has anything like this been attempted.

Standard Visible L. C. Smith

Perfect machines, Standard size, Keyboard of Standard Universal arrangement writing 76 characters—universally used in teaching the touch system. (Keyboard writing 84 characters \$1.00 extra.) The entire line of writing completely visible at all times, has the tabulator, the two color ribbon with automatic reverse, the **Back Spacer**, in fact every late style feature and modern operating convenience. Comes to you with everything complete, tools, cover, operating book and instructions, ribbon, practice paper—nothing extra to buy. You cannot imagine the perfection of this beautiful typewriter until you have seen it. I will send it to you P. O. B. Chicago for five days' free trial. It will sell itself, but if you are not satisfied that this is the greatest typewriter you ever saw, you can return it at my expense. You won't want to return it after you try it—you cannot equal this wonderful value anywhere.

You Take No Risk—Put In Your Order Now

When the typewriter arrives deposit with the express agent \$9.30 and take the machine for five days' trial. If you are convinced that it is the best typewriter you ever saw, keep it and send me \$3.00 a month until our bargain price of \$48.30 is paid. If you don't want it, return it to the express agent, receive your \$9.30 and return the machine to me. I will pay the return express charges. This machine is guaranteed just as if you paid \$100.00 for it. It is standard. Over one hundred thousand people own and use these typewriters and think them the best ever manufactured.

The supply at this price is very limited, the price will probably be raised when my next advertisement appears, so don't delay. Fill in the coupon today—mail to me—the typewriter will be shipped promptly. There is no red tape. I employ no solicitors—no collectors—no chattel mortgage. It is simply understood that I retain title to the machine until the full \$48.30 is paid. You cannot lose. It is the greatest typewriter opportunity you will ever have. Do not send me one cent. Get the coupon in the mails today—sure.

HARRY A. SMITH, 231 N. Fifth Ave., CHICAGO

H. A. SMITH
231 N. Fifth Ave.
CHICAGO, ILL.

Ship men No. 21, C. Smith P. O. B. Chicago, as described in this advertisement. I will pay you the \$99.00 balance of the SPECIAL \$48.30 purchase price, at the rate of \$3.00 per month. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee for one year.

Name

Address

.....Pop. Mech. Mar.

Be a Manufacturer

OF

HAYWOOD RETREADS

MAKE \$3,000.00 A YEAR TO START

and more as you get accustomed to the business. Sounds like a whole lot of money, and it is—looks pretty big from where you stand if you are earning just an ordinary salary at an ordinary job, but why continue the job—why be on that side of the fence? Why not come over on this side—the manufacturing side—where the grass is greener and the picking is better?

It is not every business that will permit you to start with a very small investment. Most manufacturing business require big capitalization. And rich men take the profits while you, the producer, get a salary and the small end. But here is a business that gives **big returns, quick returns**, and the demand for your product is ahead of the supply and increases every day in the year. Start a Haywood Tire Repair Shop

MAKE \$250.00 A MONTH—\$3000.00 A YEAR

The certainty of success in this business is about as sure as anything in this world can be. **Automobile owners increase by the thousands each year and the tires are still the least durable part of the car.** Every owner tries to cut down his tire expense—every owner tries to repair his tires as long as they will hold together and this brings about

YOUR WONDERFUL OPPORTUNITY

You might just as well be the first to enter this paying business in your town—**open your shop and let the money roll in.** Every automobile sold means more tires to mend. You start with one machine. The business grows fast. You need another and then another. Soon it gets to be a regular business of adding machine—after—machine until the last thing you know you are running a big shop—you are operating in a big way—you are a real business man and a factor in your community. **You know that punctures and blow-outs are common—tires need retreading and vulcanizing every day—something going wrong all the time—owner after owner forced to buy new tires because they cannot get the old ones fixed.**

If you are in the business, operate a tire repair plant as a side line in connection with your present business, garage or salesroom. Any place where there are many automobiles yields a big steady business, besides the transient work. Experience is absolutely unnecessary. You can learn quickly. Anyone with a little mechanical turn or who can simply follow directions, can learn in a few days on old tires, to do the best work. Then business comes fast and easy.

REPAIR TIRES AT HOME

Young men make money to attend college or start a garage and repair business. Automobile owners—repair your own tires. Save money.

Pay for your outfit in a short time. We have special outfits for home use. Mr. Any-Man, it's worth while to investigate. There is money in it. It's a field of wonderful possibilities. Make up your mind and send for our catalogue today. Learn of the wonderful money making possibilities in this fascinating new business. Make something—supply a want—become a manufacturer. This is your chance.

HAYWOOD TIRE
& EQUIPMENT CO.
861 Capitol Ave.
Indianapolis, Ind.

Without any obligation upon my part please send me your complete FREE catalog of tire repair outfits.

Name.....

Address.....



THE
HAYWOOD
TIRE &
EQUIPMENT
CO.

861 Capitol Ave. INDIANAPOLIS, IND.

Please Mention Popular Mechanics

Lower Power Cost Proves My Higher Engine Quality



Latest WITTE Prices

STATIONARY

2 H-P.	\$34.95
4 H-P.	69.75
6 H-P.	97.75
8 H-P.	139.65
12 H-P.	219.90
16 H-P.	298.80
22 H-P.	399.65

FORTABLE

2 H-P.	\$40.95
4 H-P.	82.80
6 H-P.	132.90
8 H-P.	190.40
12 H-P.	279.80
16 H-P.	378.70
22 H-P.	481.35

SAW-RIG

6 H-P.	\$165.40
8 H-P.	227.10
12 H-P.	324.50

My engine H-P ratings have not been raised to make prices look low. My ratings are the same as in previous years—a liberal surplus of power in each case over the regular rating—while my prices are lower than ever.

A WITTE Engine of any size is guaranteed to give its full rated horse-power with a liberal surplus. So, probably, will any other strictly high-grade engine. But the mere ability to deliver its rated horse-power is not all that is needed to prove engine quality. The big question to consider is this: "How much will it cost in fuel, lubricant, and upkeep expense to get that rated horse-power out of an engine?" Real engine quality is measured by the engine's ability to keep that cost down to the lowest possible notch. And, other things being equal—strength, durability, simplicity, ease of operation, smoothness of running—the engine which keeps its operating cost down to the lowest notch is the engine for you to buy.

WITTE ENGINES

Kerosene, Distillate, Gasoline and Gas

Thirty years ago when gasoline and other like fuels were cheap almost any type of engine that could pull its rated load, regardless of amount of fuel used, would answer the user's purpose. Those early engines were mostly over-heavy and a large part of their own power was consumed in overcoming excessive friction of their over-heavy parts. Today fuel is a matter of first importance. I foresaw this years ago and began working toward a cheaper power cost. The result is the WITTE Engine of today which, measured by the cost of power put into the drive belt—its actual dollar-earning value—has set a new standard for engine efficiency. A saving of 25% of the fuel used by older type engines amounts, in a year, in many cases to more than enough to pay the entire first cost of a WITTE Engine.

Sent Direct From My Factory To User CASH OR EASY TERMS

Five Year Guarantee On Efficiency And Durability

For 28 years the WITTE has maintained its lead in Engine Quality. But it has been hard to keep the cost of manufacturing down to the point where I could also lead in low prices. But I've done it. Compare my prices with others and see how much you save on the first cost of a WITTE—less nothing of the steady saving on fuel and upkeep.

FREE ENGINE BOOK. Tells why I use semi-steel castings, instead of common grey iron; why I make cylinder and bed separable; vertical valves; four-ring pistons; automobile style ignition; safety spark shift for easy starting; and explains other features without which no engine is of high grade quality. Mail coupon today.

ED. H. WITTE, Witte Iron Works Co.,
1740 Oakland Avenue,
Kansas City, Mo.

ED. H. WITTE, Witte Iron Works Co.,
1740 Oakland Ave., Kansas City, Mo.

Without cost to me, and with no obligation on my part, I should like to receive your latest and finest Engine Book, and to investigate your New Liberal Selling Plan.

Name

Address.....

WITTE
Saw-Rig
Sizes: 6, 8 and
12 H-P. Kerosene
and Gasoline en-
gines furnished in this
style.

Please Mention Popular Mechanics





A real guarantee on roofing!

A useless risk is to buy roofing not guaranteed by a responsible concern. When you buy our roofing you get the written guarantee of the world's largest manufacturers of roofing and building papers.

Roofings, like most people, prove their worth by the test of time

Buy materials that last

Certain-teed

Ask your dealer for products made by us—they bear our name.

Asphalt Roofings

(All grades and prices)

Slate Surfaced Shingles

Asphalt Felts

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Tarred Felts

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Roofing

1-ply guaranteed 5 years

2-ply guaranteed 10 years

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Metal Paints
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Shingle Stains
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General Roofing Manufacturing Company

World's largest manufacturers of Roofing and Building Papers

New York City Boston Chicago Pittsburgh Philadelphia Atlanta Cleveland Detroit
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Pictures that are Worth Money

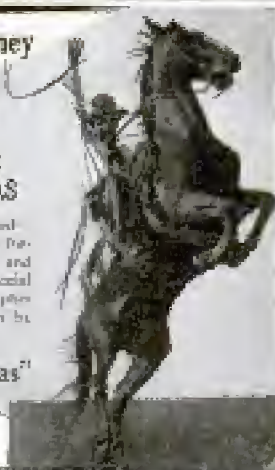
are those that show lines of detail that the eye can not grasp and retain. The pictures snapped with

GOERZ LENSES CAMERAS

street scenes that can be found nowhere that illustrate and give the story. This is why Goerz Lenses and Cameras are so widely used by special correspondents and professional photographers. A Goerz lens can be fitted to the camera of your own make.

Our Book on "Lenses and Cameras" will be sent to you for the asking.

C. P. Goerz American Optical Co.
3250 East 34th Street, New York



The U. S. Weather Bureau, in 1914, found another opportunity for service in the timbered regions of the west during periods of unusual drought. This has been taken advantage of through the issue of special forecasts of hot, dry winds, which are disseminated directly to the officials of the fire patrols of the Forest Service, and other similar organizations, placing them on their guard at times of unusual danger of fire inception.

\$42⁰⁰ "GUARANTEED" GRADE "A" PLUMBING & HEATING SUPPLIES.

COMPLETE AS SHOWN DIRECT YOU AT

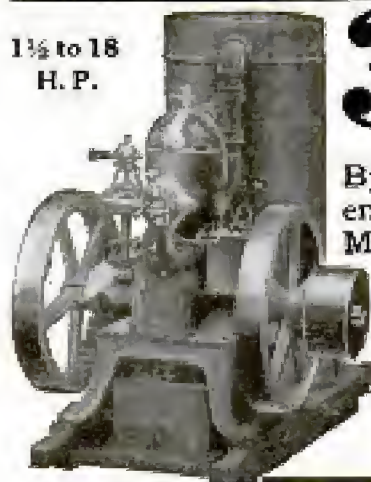
WHOLESALE PRICES

J. HARDIN CO.

35 YEARS AT 4533-43 COTTAGE GROVE AVE CHICAGO.

SEND FOR CATALOG

1½ to 18
H. P.



34c

Runs this 6 H. P. Engine for a 10 hour day on KEROSENE

By means of the patent throttle you can run it as a 4 H. P. engine for 23 cents a day, or as a 2 H. P. for 12 cents a day. Many other strong points; force-feed lubrication; uniform speed; sight-feed fuel supply; automobile muffler; no cranking; runs either way; uses any fuel oil satisfactorily. And it's **Guaranteed for 10 Years.** Write for catalogue and 30 days' free trial.

WE PAY THE FREIGHT

ELLIS ENGINE CO., 2871 East Grand Blvd., Detroit, Mich.



Our collection of rare old violins is one of the largest in America. Write today for special art catalog.

10c a Day

Now Buys This Superb Baader Violin

AN exquisite instrument—perfect in tone and superbly finished. Made by the great violin maker, J. A. Baader, and now offered direct to you at the rock-bottom price. *And you may pay this rock-bottom price at the rate of only 10 cents a day, 10 days' free trial.* Write for special circular.

WURLITZER

200 years of instrument making

It is only because we have mammoth facilities for buying in large quantities that we are able to make this startling offer. Write today for special violin circular. We supply the United States Government.

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THERE is no limit to your earning capacity—sounds exaggerated, but it isn't. In small town or large city there's a way for you to earn \$20 to \$30 a day—up to \$3000 a year and more—with one of our B. B. Power Vacuum Cleaners—

30 DAYS' TRIAL

Try it 30 days—see for yourself. It's a great chance to start a business for yourself—just what you want—the very opening you've been looking for.

Tremendous Profits

ing with you. Change this—work for yourself. Get all the profits. Be independent. Remember how much you can earn daily—\$20 to \$30 is clear profit—

\$20 to \$30 is easy with one machine—many operate two or three—and profit from others labor. No doubt that is what someone is doing with you. Change this—work for yourself. Get all the profits. Be independent.

Start a Business of Your Own

\$500 to \$1000 a month. Profits soon pay for the machine. Business is not overrun—profitably—thousands and thousands of homes will never own a vacuum cleaner of their own. These will never think of owning them when they can depend on you.

You Can Start Small

Start with one home on a street—soon half the homes in that neighborhood want regular service. Endless things to be cleaned—rugs, matting, carpets, mattresses, curtains, upholstered furniture, besides walls and floors



Write postal or letter for Free Book. Tells whole story.

Others Are Doing It—So Can You Churches, lodge rooms, dance halls, hotels—hundreds of places can use your work. No experience necessary—just a little push and courtesy. Clear \$8000 upwards a year.

Mr. Halshaw, writes: "The B. B. does all you claim. I knock out from \$25 to \$25 in six hours easily." When the money is earned it's practically all yours. The expense is trifling for the gasoline engine. Mr. Stoler, writes: "It's the simplest dirt sucker I ever saw. I make \$20 a day with it." Among all these opportunities. Learn that there is no other business where so small an investment will bring such wonderful returns. In fact we have such explicit confidence in the wonderful money-making possibilities of our "Great" B. B. House Cleaner—that we will ship one to you on 30 DAYS' TRIAL.

COME TO SEE US AT OUR EXPENSE

Up to a distance of 300 miles we will pay your traveling expense if you buy. Start now—somewhere—anywhere. Send today for our free book and complete particulars regarding the 30 days' trial. Figure the number of homes in your town—compute how much it costs to clean them, each week. You can get part or all of this business. You have scores of friends who would gladly start you with their work—others will surely follow. You can depend upon a nice profitable business from the start.

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ELECTRIC LANTERN

(No Flash, Light with Wire Ball)

Full size, Solid Body, Nickel Silver Plated, 10 years' Guarantee. Water, Wind and Fire Proof. Cheaper than all. \$8.00 on sight. Agents crazy about it. See it at the Franklin County Sale. Profits will take the Wrights out of your Pocketbook. Agents' samples at \$1.00. If you are alive this is the ad to answer. Jenks Lantern Co., 206 N. 5th Ave., Chicago

THE MASTER SLIDE RULE



the only RULE IN THE WORLD whereby loads measurements of doors and windows, etc., can be taken rapidly and accurately. Also superior to any other rule for outside measurements of walls and ceilings, etc., so it can be extended and closed instantly. MECHANICS, BUILDERS, AND ARCHITECTS. TRY ONE TODAY! DON'T WAIT. Ask hardware dealer for it.

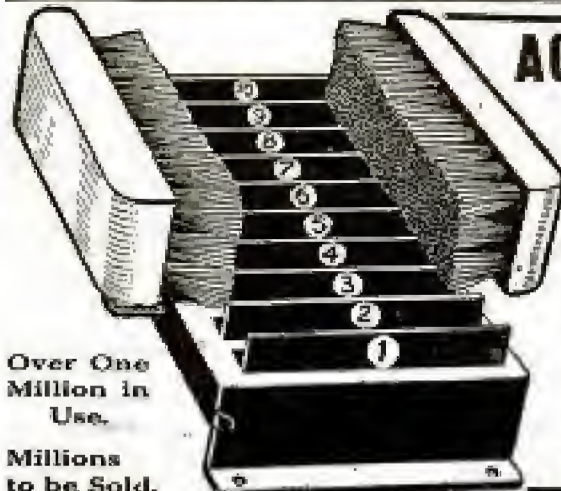
On receipt of 25 cents per Master Foot, a 4, 5, 6 or 8 foot rule will be sent to you prepaid. Large profits to agents. Write for circulars and particulars. DAHL MFG. CO. 51-A East 42nd St. NEW YORK CITY

FIRE LOSS IN THE U. S. IN 1914—The total fire loss last year was \$235,591,350, which was about \$11,000,000 more than in 1913. The 1914 loss was higher than any year in the history of the country with the exception of the three conflagration years, 1903, when Chelsea, Mass., burned; 1904, the year of the San Francisco conflagration; and 1904, when the business section of Baltimore burned. However, it must be understood that values have materially increased.

There is Big Money in Automatic Card Printing

The Automatic prints while you wait Business and Calling Cards, Tickets, Invitations Announcements & many others. Prints 100 per minute, 6000 per hour. Write today for our free catalog 36.

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Over One Million in Use.

Millions to be Sold.

AGENTS—The Million Dollar Hit!

New, wonderful home invention, just introduced, yet million sales already recorded. Tremendous, rapid sales throughout country. Agents busy—making enormous profits daily. Might opportunity for you to get the mighty dollar. Failure impossible. Experience unnecessary. Money rolls in first hour—\$10 to \$30 daily. Amazing cash records made. Waiters received.

\$50.00 FOR 7 HOURS' WORK

Never sold goods before. Arnold sold 180 in 2 days; Hagen 100 same time; Webb 10 per hour; O'Connell 25 first day. Hundreds like these. You, too, can have money in abundance. Grab the Scientific Shoe Cleaner while it lasts—you take orders—don't sell. Every family wants one on their doorstep. Replaces unsightly, unsanitary, crude door mat. Automatically removes mud, dirt, snow from shoes in one operation. Cleans sole, sides, heel. Works like magic—takes 15 to 30 seconds. Saves drudgery, time, money, shoes—saves carpets, floors. Mechanical wonder. Has 7 new patented features not found in any other shoe cleaner—10 steel blades—10 dirt outlets—twin adjustable and removable brushes—compound springs. Relates far superior. Can't stop—practically self-cleaning. Handsomely enameled. Nothing else like it. Nothing in another so easy to sell. Selling price only \$1.00. You make \$49.00 per unit. Satisfactory guarantee. Write quick for free catalog—exclusive agency. Better still, send order, sample territory. Investment anywhere.

SECURITY MFG. CO., Dept. 93, TOLEDO, OHIO



Make Your "Bike" a Motorcycle

Yes, thousands of **others** have turned their old-fashioned bicycles into up-to-date, swift, sure, easy riding, high power motorcycles with the easily attached, inexpensive *Shaw motorcycle attachment!*

Fits bicycles of any make or size. Everything is complete and we send it to you all ready to attach to your bicycle in just a few minutes without the aid of an expert mechanic and without any special tools—just an ordinary wrench and screwdriver.

Built of highest grade, most serviceable materials; every part guaranteed; plain, easily understood directions sent with each equipment. Thousands of enthusiastic owners everywhere. Here is **your** chance to get a powerful, dependable, durable, fine looking and speedy motorcycle at a price so small you will wonder how you ever got along with the old-fashioned "leg power" machine!

Read What These Users Say of the Shaw Motorcycle Attachment

"IT'S THERE—RUNS FINE"

Moena Lake, Minn., December 7, 1914.

Shaw Manufacturing Co., Galesburg, Kansas.

Gentlemen: The Motor Attachment that you sent me is a dandy. It runs fine. It is right there, Johnnie on the spot, all kinds of roads and hills.

The boys here think it is a little dandy. There are quite a few of the boys thinking of buying an Attachment in the spring. As our winter is setting in now they could not make use of it any more this fall.

WALTER J. HEE.

"HAS ENOUGH POWER FOR TWO"

Rockville, Mo., December 8, 1914.

Shaw Manufacturing Co., Galesburg, Kansas.

Gentlemen: I got the engine and put it on Friday night. I used two bikes with riders on to Rockville, a distance of five miles, and brought one back. The engine has power for two bicycles.

JOSEPH HICKS.

"TAKES ME OVER ALL KINDS OF ROADS"

Shaw Manufacturing Co., Galesburg, Kansas.

Dear Sirs: In reference to your 2 1/2 H. P. Shaw Bicycle Attachment, must call it a very reliable attachment for bicycles which does away with all foot peddling, giving me the sense of coasting down hills all the time. As to power it will take me over all ordinary roads and hills. Have run my machine in the dead of winter while 50 degrees below zero as well as towing two bicycles and riders in ordinary weather. A "Shaw" makes all roads look alike. The joy of bicycle riding without pumping.

GILBERT SEARIGHT, Milden, Sask., Canada.

"I AM MUCH PLEASED"

Richmond, Va., August 12, 1914.

Shaw Mfg. Co., Galesburg, Kansas.

Gentlemen: I am much pleased with the little attachment. I have seen two of them in action since writing you. They were working very nicely. I enclose my order and part payment. Please ship this order soon as possible by express, balance C. O. D.

W. H. COLMES.

3011 W. Clay St., Richmond, Va.

"GIVES PERFECT SATISFACTION"

Shaw Manufacturing Co., Galesburg, Kansas.

Dear Sirs: The Motor that I purchased from you is giving perfect satisfaction and has plenty of power for all ordinary hill sand. As for speed there is no other make of motorcycle around here that has anything on it. Wishing you many sales, I remain

HERMAN R. KIEFFER, Georgetown, Ohio



Thousands in Use
in America and
Foreign
Countries

SHAW
Manufacturing Co.
Dept. 74, GALESBURG, KANSAS

Please send me, free and postpaid, copy of your book illustrating and describing the SHAW Motorcycle Attachment as advertised in the March issue of POPULAR MECHANICS. Quote me your lowest net cash, factory price.

NAME

ADDRESS

Write For FREE BOOK!

We want to send you, free and postpaid, a copy of our booklet illustrating and fully describing the SHAW Motorcycle Attachment. When you read about this simplicity and the low cost of the SHAW attachment you will no longer be satisfied with your old-fashioned, slow-going, tiresome bicycle, but will want to send and join forces with the thousands of other go-getters who are now riding the high speed trail with a SHAW!

Send name on the coupon or postal card for the free booklet today

Shaw Manufacturing Co.
Department 74 Galesburg, Kans.

Western Electric

Washer and Wringer

Simple - Saving - Sanitary

Washing clothes by electricity is easiest, quickest, cheapest and most thorough. Cost of current is very small. The saving on clothes and time will quickly pay for the electric washer.

In this Western Electric Washer the cylinder automatically reverses, gently swashing the clothes back and forth until perfectly clean. The wringer is also reversible, and has a safety release. The operating mechanism is enclosed and does not require attention while running.

Get full information—FREE. Write nearest house below for our Free Trial Plan and copy of Booklet No. 86-AW.



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Manufacturers of the 8,500,000 "Bell" Telephones

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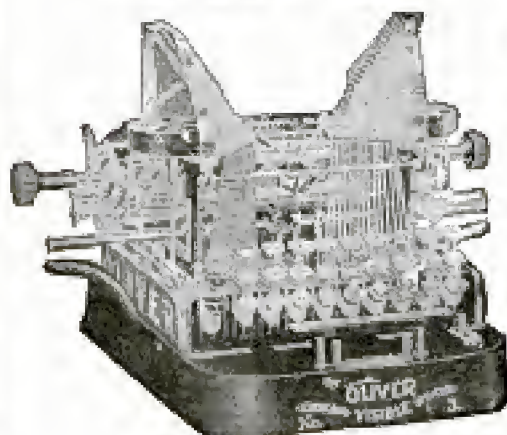
EQUIPMENT FOR EVERY ELECTRICAL NEED

FREE Tells How to Win Song Birds to Live in Your Garden

That article on *Native Song Birds in Feb.* Popular Mechanics (pages 107-108) was illustrated by cuts of the famous **Dodson Bird Houses**—which are winning song birds as tenants in thousands of gardens. If you want to have native birds write for The Dodson Book About Birds at once—its free.

Among the 25 kinds of houses, shelters, bolls, etc. I make for birds are: Dodson Purple Martin House—25 pieces and with 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st, 32nd, 33rd, 34th, 35th, 36th, 37th, 38th, 39th, 40th, 41st, 42nd, 43rd, 44th, 45th, 46th, 47th, 48th, 49th, 50th, 51st, 52nd, 53rd, 54th, 55th, 56th, 57th, 58th, 59th, 60th, 61st, 62nd, 63rd, 64th, 65th, 66th, 67th, 68th, 69th, 70th, 71st, 72nd, 73rd, 74th, 75th, 76th, 77th, 78th, 79th, 80th, 81st, 82nd, 83rd, 84th, 85th, 86th, 87th, 88th, 89th, 90th, 91st, 92nd, 93rd, 94th, 95th, 96th, 97th, 98th, 99th, 100th, 101st, 102nd, 103rd, 104th, 105th, 106th, 107th, 108th, 109th, 110th, 111th, 112th, 113th, 114th, 115th, 116th, 117th, 118th, 119th, 120th, 121st, 122nd, 123rd, 124th, 125th, 126th, 127th, 128th, 129th, 130th, 131st, 132nd, 133rd, 134th, 135th, 136th, 137th, 138th, 139th, 140th, 141st, 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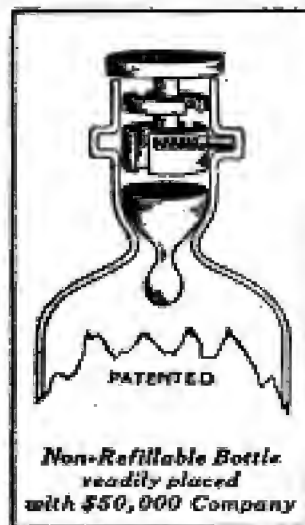
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Manufacturers Calling for Over Two Hundred Inventions

Money Is Waiting to Back the Good Idea

(By a Washington Patent Attorney)

Never was there so good an opportunity for the inventor of something—*anything*—of merit as right now.

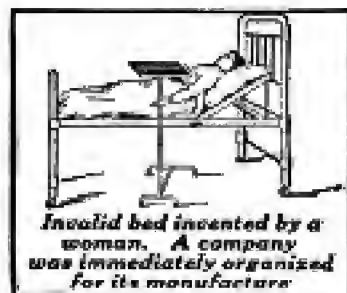


Manufacturers with money and facilities are asking for ideas—*calling* for them. The supply is not nearly equal to demand. Over 200 inventions are asked for in a list just given in a little book "What to Invent." The demand is not for anything extraordinary—just the common everyday things that make work easier or life more pleasant in the household, the shop or the field.

You might think the possibilities of the window screen had been exhausted, but I know of 28 concerns that are looking for a new screen, duly covered by patent, which they can manufacture. I know of 46 manufacturers and others who are ready to manufacture any good, patented household article such as can openers, baking pans, coffee pots, washing machines carpet sweepers and other devices.

Within the last few weeks I have received forty special requests for a dishwasher and drainer; seventeen others request an improvement in scissors. Manufacturers know that everyone must have a pair of scissors in the house, and they realize that a novelty in them would always sell in place of the old kind, and hence the demand. Among my letters are sixteen requests for a device to turn sheet music on a music stand or piano, and seventeen people are interested in the

purchase of a patent on a device for holding an electric light in any position. Besides these there are hundreds of manufacturers who do not specify any particular device but state that they would be interested in anything of merit



A Chicago man says: "I want something that can be sold to farmers by mail. There is practically no limit to the investment my associates would make in a good proposition." A man in Woodhaven, N.Y., says he is in the market for a small household article, light in weight, which can be sold somewhere around ten cents.

A prominent manufacturing company is interested in something to sell to hardware stores, but would also be interested in other things promising to be money-makers.

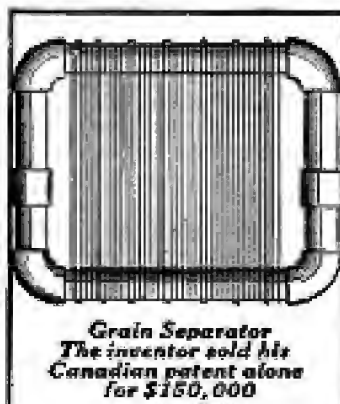
A man in Revere, Mass., says: "I am looking for something that can be manufactured, plant equipped, etc., and marketed for an outlay of not over twenty-five thousand dollars."

A big textile machinery company says they are interested in newly patented devices that can be

either bought outright or manufactured on royalty. They do not require machinery inventions alone, but anything of merit.

A company in Belvidere, Illinois, wants patents on small tools or metal novelties.

A Dayton, Ohio, concern writes for some machine or device that would have a general sale throughout the land.



The names and addresses of these prospective purchasers are supplied absolutely without charge by Messrs. Chandlee & Chandlee to those who obtain patents through their firm. This firm has been in practice before the Patent Office for over twenty years, and its members are, consequently, familiar with every detail of patent work. They also issue a booklet entitled "How to Obtain a Patent," which tells in simple words just how to go about protecting an invention. The two books, "What to Invent" and "How to Obtain a Patent," are both free. Why don't you write for them and learn what manufacturers are looking for and how to protect your ideas? If you have an invention, send a sketch or model and description of it to Chandlee & Chandlee, 953 F Street, Washington, D.C. They will give you a free opinion as to whether or not it can be patented.

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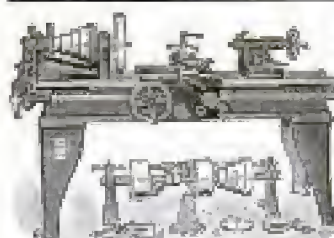


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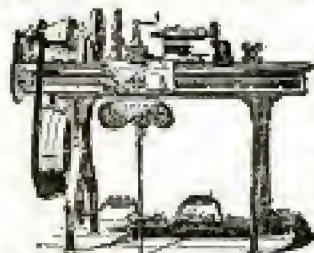
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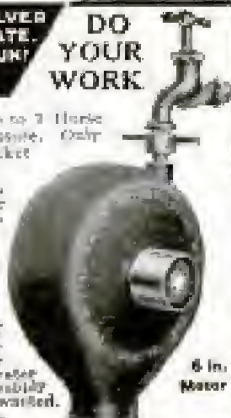
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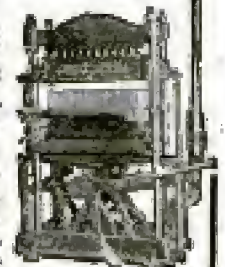
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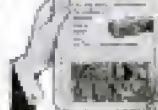
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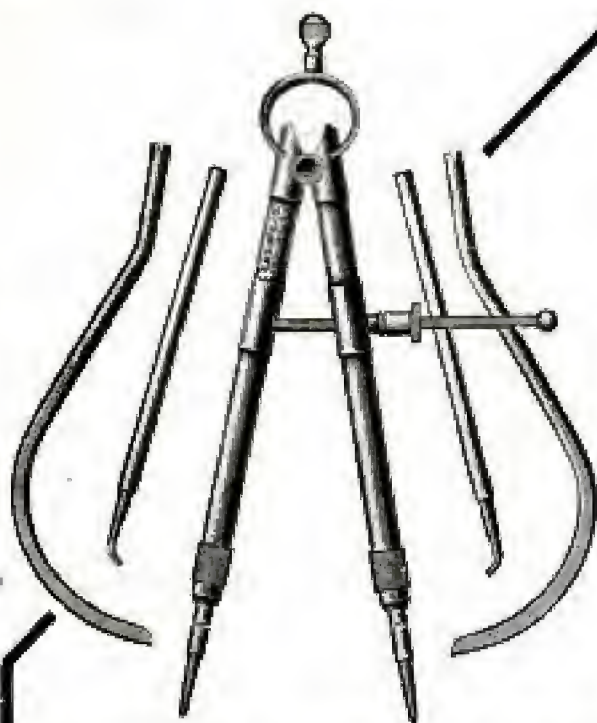
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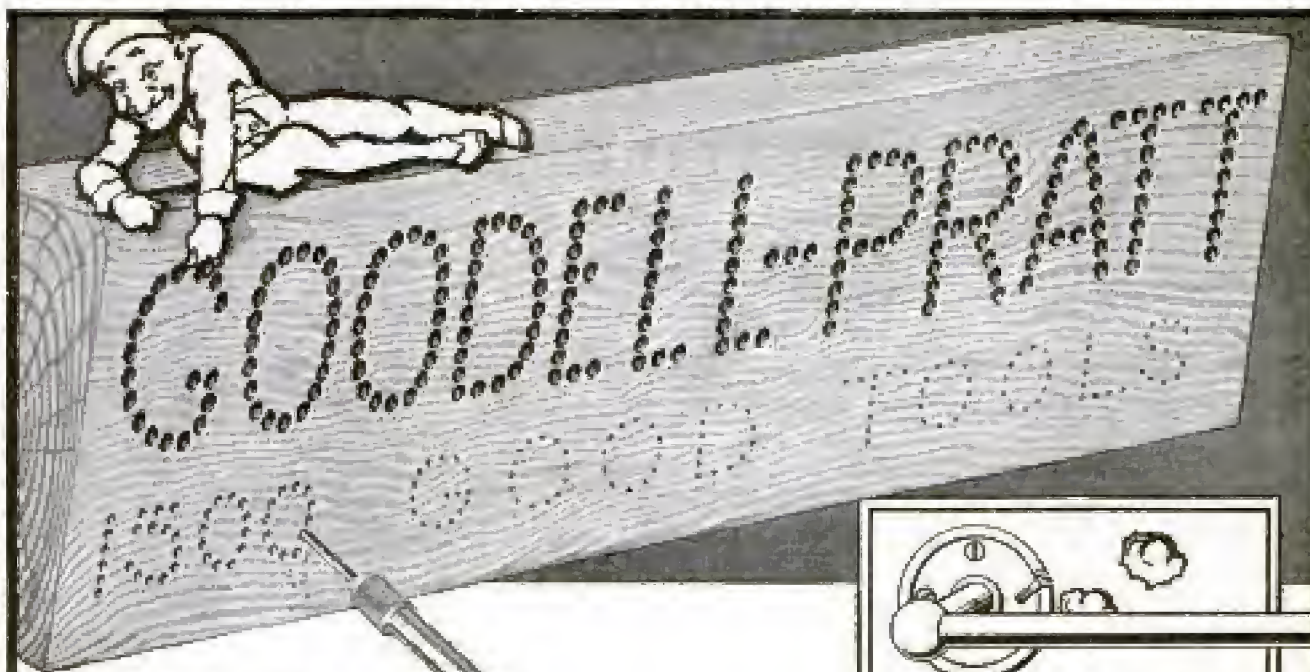
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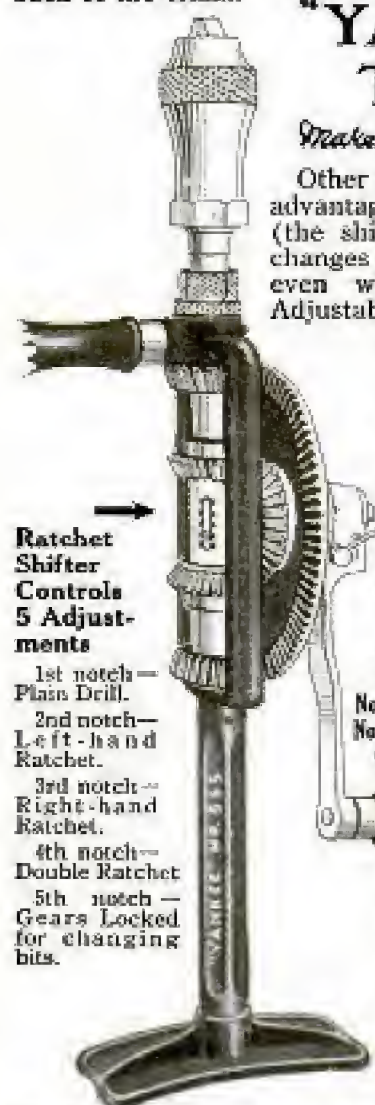
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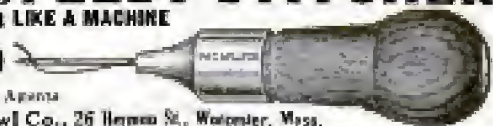
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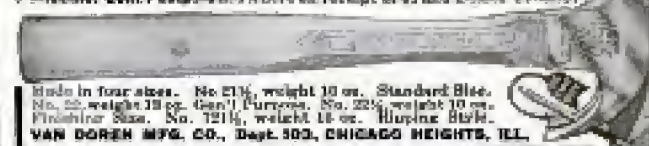
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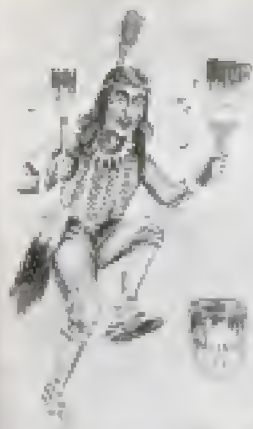
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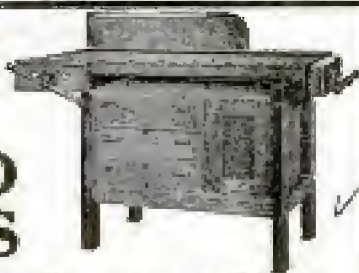
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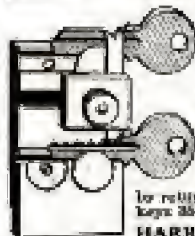
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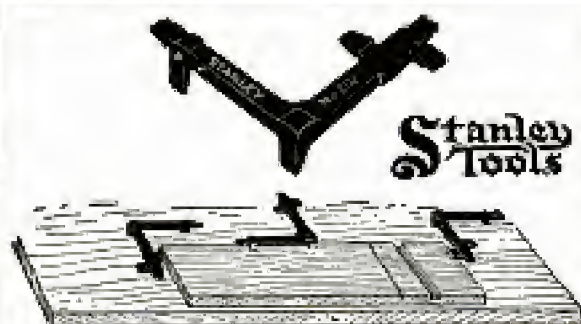
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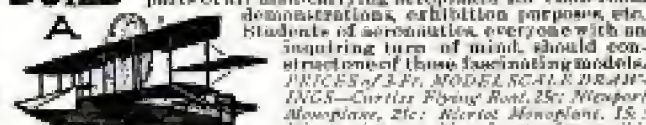
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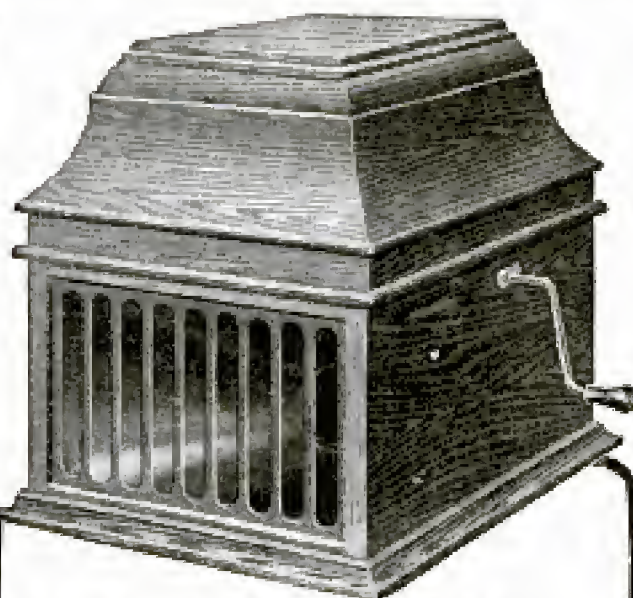
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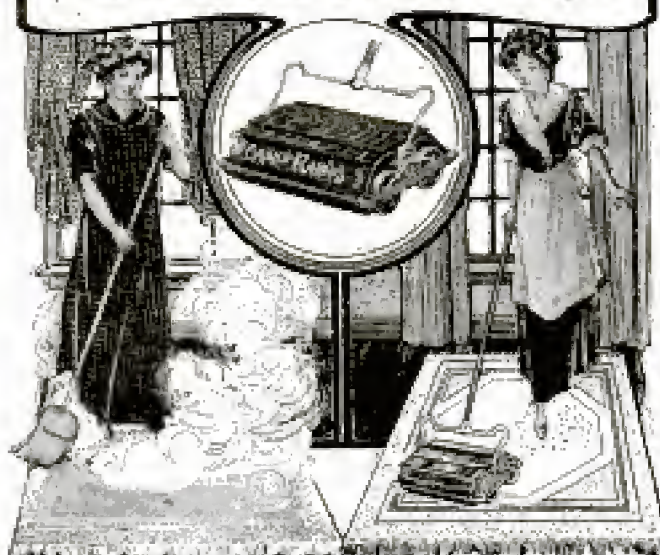
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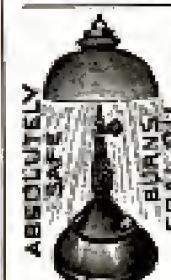


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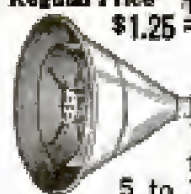
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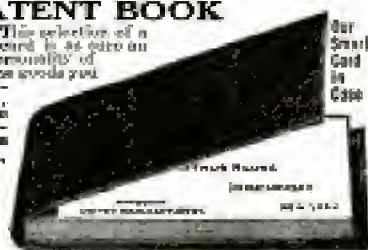


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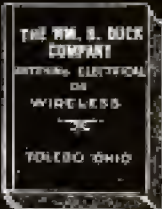
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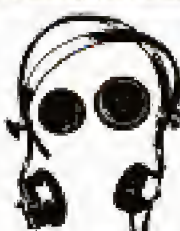
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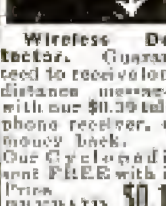
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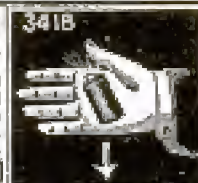
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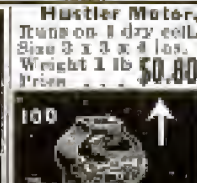
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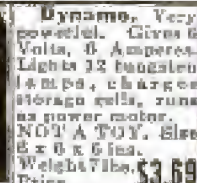
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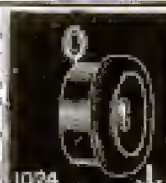
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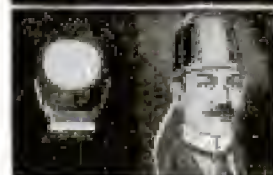


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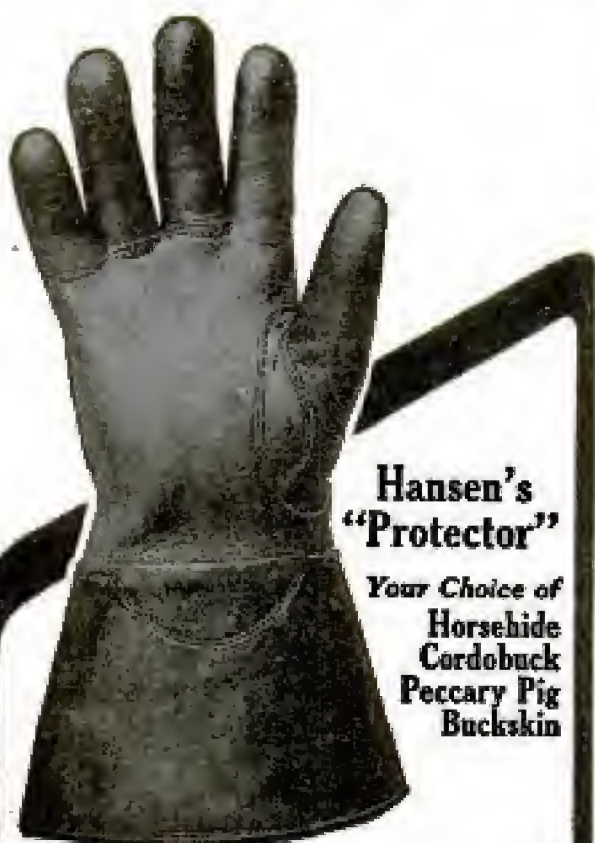
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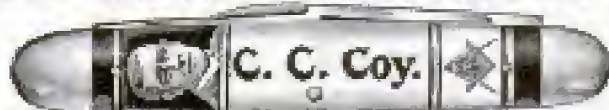
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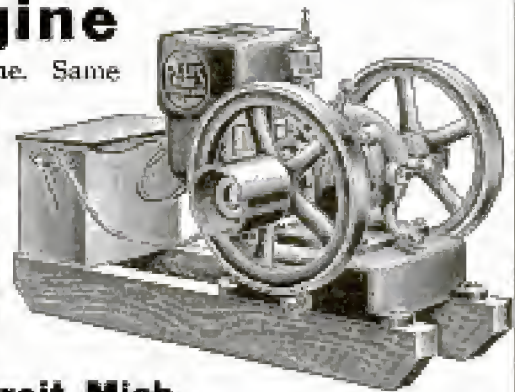
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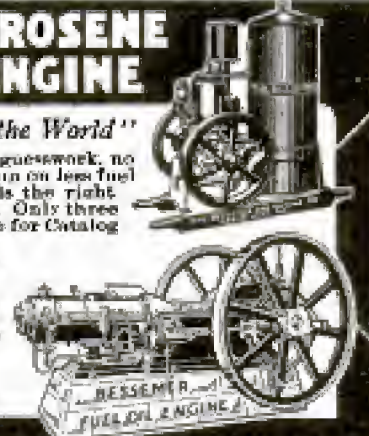
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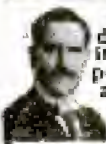
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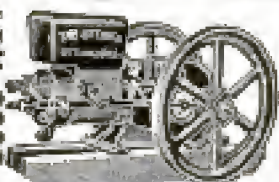


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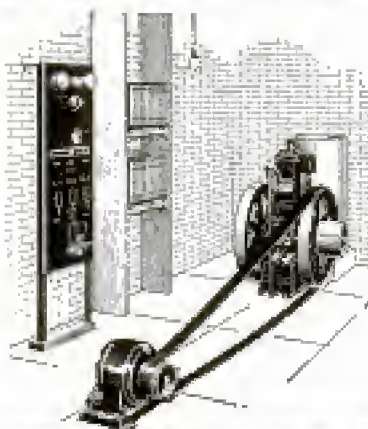
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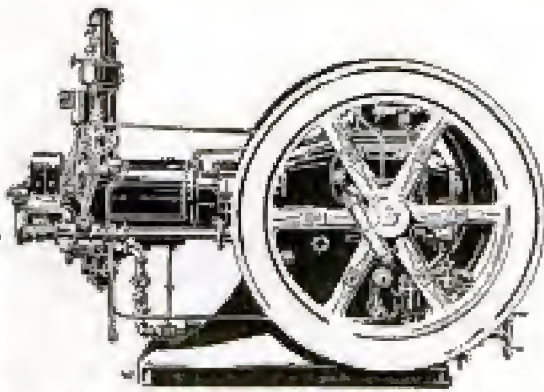
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We Say This with Confidence

Knowing the unsurpassable standards that I H C engine makers have set for themselves in manufacturing, and the absolute perfection they have always aimed at, we do not hesitate one moment in saying—whatever difficult qualifications you can possibly demand in a 1915 engine you will find them in the greatest degree on

International Harvester Oil Engines

Care and time and money are not spared in the designing of I H C engines. Elaborate and thorough experimental work is never at an end, and is always resulting in I H C engine improvements. Manufacturing expense and cost of material are not considered whenever a betterment suggests itself. I H C quality is never questioned.

International Harvester oil engines are of all styles, built for all power purposes, in sizes from 1 to 50 H. P. They run on the cheapest or most convenient fuel.

Ask us to do these two things—Send you an interesting catalogue showing the I H C engine features, and tell you the name of the nearest I H C engine dealer.

International Harvester Company of America
(Incorporated)

16 Harvester Building Chicago U S A

railway was breached almost continuously for 10 miles. The damage was so extensive that all traffic over the 10 miles had to be suspended for a month.

"VIM" ENGINE

\$25 COMPLETE

Save money by using a **VIM** 1/4 H.P. Farm Motor for churning, washing, pumping, separating, spraying, etc. Works operate easily. No valves, cams, gears or complicated parts. Water Cooled, automatic positive lubrication, sensitive governor. Weighs only 75 lbs. Comes ready to run. Fully guaranteed. Get catalog and special agency offer, **THE VIM MOTOR CO., 803 Water St., SANDUSKY, OHIO**

REDEMOTOR SMALLEST GAS ENGINE

in general use. Runs washing machine, churn, pump, cream separator, dynamo, bench lathe, railway speeder, or any machine requiring light power. Starts easy and gives as reliable service as an electric motor, with same floor space and weight. Run it anywhere, anytime.

Invest in a Redemotor and see how much easier your chores will be. Write us now, N. & W. I. H. P. Send for catalog & Low Prices.

ELGIN WHEEL & ENGINE COMPANY, ELGIN, ILL.

2 H.P. AMERICAN OUTBOARD MOTOR

Equal of any \$70 row boat motor on the market. Made of the same high-grade materials by the most skilled mechanics in the industry. But instead of charging you the dealer's commission, we sell

Direct From Factory to You

cutting the price to only \$44.95. Instantly attached to any row boat. Speed from 6 to 8 miles an hour. Adjustable for any angle or depth of stern. Runs forward or backward. Weighs about 60 lbs. Can be used in salt or fresh water. Steers with propeller. We also build a rubber skiff model. Magneto ignition, 12 Speeds, 44 small extra cost. Send for details.

American Engine Co., 601 Boston St., Detroit, Mich.

\$44.95

Here's Health and Power, Vim and Vigor



ALL YOURS!

Strength that is more than mere muscular strength. The strength of perfect health, abundant nerve force—the strength of keen relish is now within your reach through vibration! Nine out of ten

people are only half alive. How about yourself? Listen! All the joys of life, strength and youth may be returned to you by vibration. Send the free coupon for the big new book that will tell you all about it.

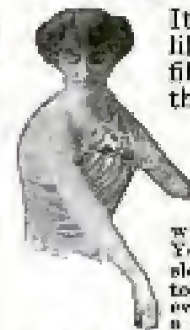
WHITE CROSS ELECTRIC VIBRATOR



White Cross Electric Vibrator and its Attachments.

This wonderful instrument gives you three of nature's greatest curative agents—vibration, faradic and galvanic electricity. We will send this wonderful machine to you on free trial. Feel its health-giving vibrations for yourself. Don't be weak. You can be strong and healthy if you will by using the White Cross Electric Vibrator.

Vibration Is Life



It will chase away the years like magic. Every nerve, every fibre, of your whole body will thoroughly tingle with the force of your own awakened power.

All the keen relish, the pleasure of youth, will fairly throb within you. Rich, red blood will be sent coursing through every vein and artery, you will be made over—new from head to foot. You'll sleep the health giving restful sleep like you used to. Your self-respect even will be increased a hundredfold.

LINDSTROM-SMITH CO.

Dept. 9193
1100 S. Wabash Av.
CHICAGO, ILL.

Send the Free Coupon

Just your name and

address on the free coupon or a letter or post card is enough. We will send you absolutely free and prepaid, our new book, "Health and Beauty." It's free. No obligations of any kind. Write at once.

Please send me, absolutely free and prepaid, your new book "Health and Beauty," and full particulars about the free trial offer on the White Cross Electric Vibrator. I assume no obligation of any kind.

Lindstrom-Smith Co.

Dept. 9193
1100 S. Wabash Av.
CHICAGO

We manufacture White Cross electric iron, hair drivers, shavers, DeLia's White.

Name.....

Address.....

My Electrical Dealer's Name Is.....

Caille Speed Motor

Push - Button Control

Has a high speed, trolling speed, a neutral, slow reverse and fast reverse adjustments, all accomplished by simply pressing a button without stopping the motor or interfering with its normal speed. Pressing another button stops the motor. Action is absolutely mechanical and positive—no unreliable springs or automatic devices.

Has Enclosed Magneto

of the high tension water-proof type, embodied in the fly-wheel. Gives a good, hot spark down to practically the last revolution.

Other Caille Features

Caille Silencer Dual Ignition if desired, Water-tight gear housing, Double sealed fuel tank, Reinforced bracket and stern adjustment, Non-linking water tube, Heavy rubber steering handle. Complete details in our Free 1915 Literature.

DEALERS WANTED

The Caille Perfection Motor Company
1523 Caille St.,
Detroit, Mich.

We Also Build Marine Motors from 2 to 30 H. P.




Put Your Trust in an

"Old Town Canoe"

It looks like a sturdy canoe that stands the gaff and it lives right up to its looks. It's speedy, easy to handle and safe—more so than any canoe that ever touched water. That's its reputation among knowing sportsmen and guides.

Don't drag your arms out in a rowboat and don't gamble on other canoes. Come to canoe headquarters and buy an "Old Town Canoe"—it's a dependable buy—\$30 up, 4000 new canoes ready, immediate shipment. Write for the "Old Town" story of canoe value; we'll tell you name of nearest dealer.

OLD TOWN CANOE CO.
463 Middle Street, Old Town, Maine, U.S.A.



UNMATCHED SPEED—Extra Power—No Vibration

Speed that runs away from any other rowboat motor—power to carry heavier loads—no vibration to shake boat

The 2-Cylinder KOBAN ROWBOAT MOTOR

Last season a record proved its mettle. Absolutely dependable—easy to start—reverses by simply pressing button—woodless propeller.

2-CYLINDER—RACER TYPE

The Koban has two opposed cylinders—that's what removes vibration—3 H. P.—nearly double that of other motors—speed line propeller. Best constructed rowboat motor on the market.

Write for 1915 Catalog—Active Agents Wanted
Koban Mfg. Co., 291 So. Water St., Milwaukee



2 Cylinder
3 H. P.

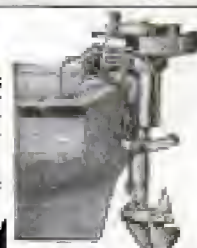
EVINRUDE

The Evinrude Detachable Rowboat and Canoe Motors embrace the Evinrude Automatic Reverse—Bath-In-Magneto—and Maxim Silencer, besides all of the characteristics of the 1914 Model.

Prices: \$60.00 to \$80.00
Battery Ignition \$5.00 less

22 Beautiful Poster Stamps sent for 4 cents

EVINRUDE MOTOR COMPANY
No. 31 Exchange Block, Milwaukee, Wisconsin, U.S.A.



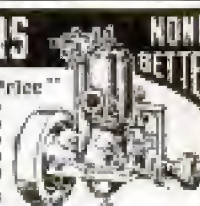
Toledo MARINE MOTORS

"Nothing Cheap but the Price"

3 H. P. 1 cyl. complete	\$ 65.00
5 H. P. 1 " "	84.00
8 H. P. 2 " "	125.00
12 H. P. 2 " "	160.00
18 H. P. 3 " "	250.00

Fully guaranteed by a responsible concern. 2 cycle, 2 port, flyless and flyless. Send for free catalog "G".

THE UNIVERSAL MACHINE CO., Pike Ave., Bowling Green, O.



The Outings You Look Forward To

LATER on, this Spring and Summer, when lake and stream have called you out into the country—will you still be limited in your fishing or picnicking to "easy rowing distance?" Or will you have a trusty, sturdy little row boat motor—a Wisconsin—to swing you and your boat smoothly and swiftly along, or slowly if you're trolling, mile after mile as far as you care to go?

Wisconsin Detachable Row Boat Motor

Your row boat motor should be a Wisconsin because you don't want any outings spoiled by motor trouble.



The Wisconsin is the most dependable of all outboard motors because it is built by men of 13 years' experience in marine motor building—it has no experimental features—it has proved itself in years of general use. It has, for instance, High Tension Reversible Magneto ignition, so it doesn't miss or stutter at slow speeds. It has Rudder Steering, so you can make sure landings with motor still. Main bearings Nickel Babbitt, interchangeable. Pistons have two rings. Crankcase Nickel Aluminum. Motor is two-cycle type, speed 200 to 900 R. P. M. All parts standardized. Write today for Free Catalog U

WISCONSIN MACHINERY & MANUFACTURING CO.
Minor Street, MILWAUKEE, WIS.

Early Morning—

A winding stream—scent of the woods—sunshine—dew drops—all the musical sounds of the wild places—and you with your Mullins canoe—fascination!

MULLINS CANOES

are so modeled and finished as to gratify your every wish for beauty, grace and durability—combining the lightness of the Indian Canoe with the exquisite finish of expert workmanship.

The Mullins Canoe Catalog, interesting and complete, is yours for the asking.

Wherever canoes are sold you will find a Mullins.

The W. H. Mullins Co.
44 Franklin St. SALEM, OHIO

World's largest manufacturers of
Steel and Wooden Boats.

An exhibit showing how a community can aid itself in making progress was arranged recently by the University of Wisconsin extension division. Among the features were model garbage cans, drawings of model private and public sewage-disposal plants, sanitary housing, good roads, parking, public markets to aid in reducing the cost of living, and street lighting.



WATKINS' SPECIAL MOTORS

1 H. P. Single Cylinder . . . 30 lbs.

1 H. P. Double Cylinder . . . 44 lbs.

1 H. P. Four Cylinder . . . 100 lbs.

A strictly HIGH GRADE Motor that will give CONSTANT and EFFICIENT service. Especially adapted for CAMPS and LIGHT BOATS. Aluminum base, copper water jacket, steel shaft, bronze bearings.

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GET THIS CATALOG

FULL OF VALUABLE INFORMATION TO EVERY BOAT OWNER ON

RACING PROPELLER WHEELS,
REVERSE GEARS AND
MARINE ACCESSORIES

LARGE CATALOG FREE. SEND TODAY

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KERMATH BOAT MOTORS

4 Cycle, 4 Cylinder, 12 to 20 H. P.

Highest quality. Silent operation. No vibration.

Controls like the finest Motor Car engine. Ex-

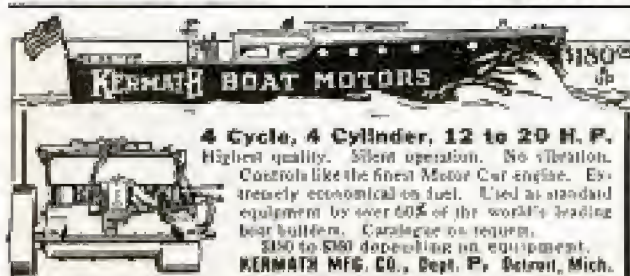
ceedingly economical on fuel. Used as standard

equipment by over 60% of the world's leading

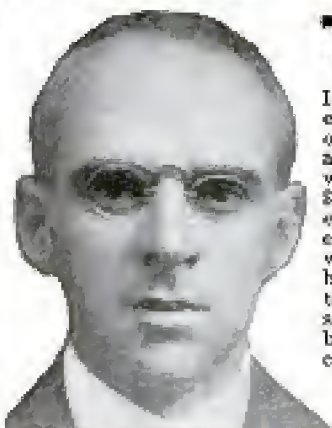
boat builders. Catalogue on request.

\$180 to \$380 depending on equipment.

KERMATH MFG. CO., Dept. P., Detroit, Mich.



MAKE MONEY THIS WAY



I want to prove entirely at my expense that I can take you out of your small, low wage job and into a profession that always offers you a bigger salary, \$2400 and more yearly, steady employment and an independent future of prosperity. I want to show you how I have helped all kinds of men out of the lowest-paid jobs and into success through training them by my personal method to become Expert Draftsmen.

Become a

DRAFTSMAN

\$2,400.00 a Year

If you realized the almost unlimited opportunities of big income and success open every day for competent Draftsmen—if you realized the independence, the influence and the prosperous future afforded in this wonderful profession—I am sure you would lose no time in becoming a Draftsman. Draftsmanship is the profession that means steady employment and prosperity regardless of unsettled conditions. Right now the need for competent Draftsmen is tremendous. Buildings, machines and structural work of all kinds are always planned and Draftsmen are needed everywhere at handsome salaries. Let me prove absolutely that right now is the time for you to begin preparing yourself for the vast opportunities in Draftsmanship.

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No matter who you are or what you work at now, let me prove quickly how easy I can train you in your own home in your spare time—how plain and practical my personal instructions are—how I teach you personally everything a successful Draftsman must know. I give you the training the big employers of Draftsmen in this country demand. When you follow my personal instructions you learn under a Draftsman who is successful. You need no previous experience—I train you from the ground up in the shortest time. Keep your present position and earn while you learn.

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Big positions paying \$2400 and more yearly are open right now. These grand opportunities are open to you if you begin at once. Let me prove how competent Draftsmen can advance to big, powerful positions as Chief Draftsman, Chief Engineer or Superintendent of big salaries or open an office and make big money.

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Write me now and I will give you absolutely free a magnificent set of Draftsman's Drawing Instruments, valued at \$17.50—same as I use. Every Draftsman needs these—they last a lifetime.

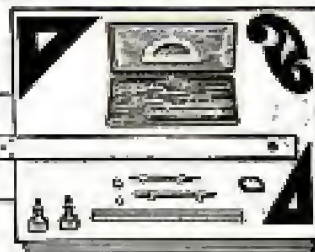
SMALLEST, EASIEST PAYMENTS

SPECIAL TUITION OFFER

To a few more students I offer my personal instruction at such small, easy payments that no matter how small your present salary, you can now become an Expert Draftsman and as an inducement for you to enroll at once I make an extra special offer of a free \$25.00 TUITION CREDIT. I am the only Expert Draftsman giving his personal instructions on such small payments. Mail free coupon now for my great profit and interesting free book. This is your opportunity. Send coupon today—immediately.

Chief Engineer

Chicago Engineering Works 445 Cass St., Chicago, Ill.



CHIEF ENGINEER, 445 Cass St., Chicago

Without obligation or cost to me send prepaid your free book, "The Road to Success," and particulars of your limited offer.

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Address



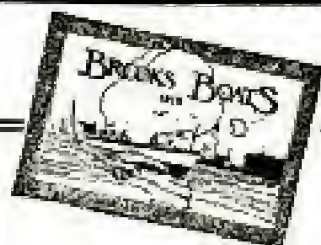
Build a Brooks Boat— Enjoy Boating Charms

Haven't you always had a dream of some day owning a beautifully designed cruiser, a speedy motor boat or a handsome launch, and that you could go whenever and wherever you pleased on lake or stream, in your own boat? Let us tell you how easily you can make that dream come true with the aid of the Brooks System. Thousands of men and boys are today able to enjoy the charms of boating only because the Brooks System enabled them to build their own boats easily, in a surprisingly short time and at a low cost.

Brooks System Saves You $\frac{2}{3}$ in Price

All the parts come to you cut, shaped and fitted. Full-sized patterns and illustrated instructions show you how to put the parts together. With the Brooks System, you pay for only the actual material needed. You save just about two-thirds what the boat-builder would ask. You have complete confidence in your boat because you know that it is designed to be thoroughly seaworthy and that it is built with the very highest-grade materials. The directions are so clear—the full-sized patterns are so easy to work with that anyone can build a beautiful boat. You do not need experience. We will show you the way. Mail a postal today for the Brooks Boat Book—it's free. Address:

Brooks Manufacturing Company Originators of the Pattern System of Boat-Building. **2803 Brooks Ave., Saginaw, Mich.**



Write—Get This Boat Book Free

See illustrations of beautiful new-style cruisers, "V" Bottom Models, Motor Boats, Launches, Sailboats, Rowboats and Canoes, boats of all kinds that you can build easily, economically, in your spare time.

Only \$37

Pays the complete knocked-down frame for a 12-passenger 23-ft. handsome motor boat—speed $9\frac{1}{2}$ to 14 miles per hour. This includes full-sized patterns and directions to finish building the boat. We make 3 propositions: (1) We send complete full-sized patterns. (2) We send knocked-down frame and patterns. (3) We send complete knocked-down boat. Fully illustrated instructions always included.

Boat Patterns \$3 and Up

All patterns are taken from actual models. We design and build a complete boat, put it through the most rigid tests. If it proves itself perfect in design and construction, we use the boat as a model to make patterns from. Write for boat book showing illustrations of latest, most seaworthy styles.

Joymotor

For Rowboats and Canoes



Marine
Engine
Dealers
Write for
Agency
Proposition

Joymotor will fit any boat ever made—square stern, pointed stern or decked stern—without additional attachments. Just hook it on or off in a jiffy. Joymotor's unusual bracket takes care of everything. No matter where you hook Joymotor you know it will fit the boat you have to use. For Canoes Joymotor special bracket sets motor low down—safest first.

REVERSING PROPELLER

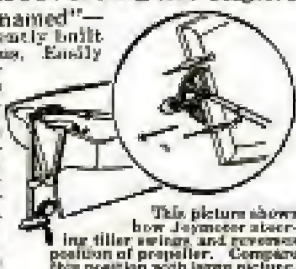
The exclusive patented feature of Joymotor that makes it the safest, most convenient, easiest to handle motor in the world. No more danger of accidents. No drifting or paddling to dock or shore. No more awkward, hurried cranking to reverse the motor. Just move the steering tiller to right or left and Joymotor steers instantly—Stops your boat and backs it up without reversing the engine.

"Joymotor is rightly named"—

"A joy to own"—evidently built to enjoy—that's what owners tell us. Easily portable. Weighs 52 lbs. Runs your boat 7 to 9 miles per hour—canoe 10 to 12. Has real high tension magnets and real carburetor, efficient oiling system and does not have unsightly, tangled up pump hose. Write postal now for catalog and life size picture of Joymotor giving full details of the finest, most satisfying portable motor to be had. Write postal now to:

JOY ENGINEERING COMPANY
330 Tribune Bldg., CHICAGO

Please Mention Popular Mechanics



This picture shows how Joymotor steers—tiller steers and reverses position of propeller. Compare this position with large picture.

The total export of coal from the United States for the fiscal year ended June 30, 1914, was valued at, \$26,000,000.

SWEET MOTOR 4 H.P.

Fastest—most dependable—
best built—4 H.P.—reversible—
fits any boat. Most fuel
economical—batteries or gas.
Sold only direct from factory.
Write for free catalog and prices.
Letters: 30 Day Special Price.
SWEET MFG. CO.
341 Griswold St. Detroit, Mich.

VIM MOTORS

5 to 22 H.P.
1, 2 and 3 cylinder
Gasoline or Kerosene
Models, regular, or heavy
duty, 8 H.P. up, simple,
accessible—absolutely de-
pendable. Right type for
line. The best value for
the money. The best weight
value. Double 22 H.P. up.
Not a huckstering. Heavy
duty business.

"Only built with my Vim is
that I did not get it sooner.
It runs and sounds like an
electric fan. It is steady
last Sunday on a gal. race-
course—that a right good for a
10 H.P. engine. My friend
says his motor is a gasoline
motor and if he can write it,
"Vim goes in his boat." This
from Mr. H. Hall, Ames, Pa.
VIM MOTOR CO.
103 Water St., Sandusky, Ohio



GRAY MOTORS & BOATS

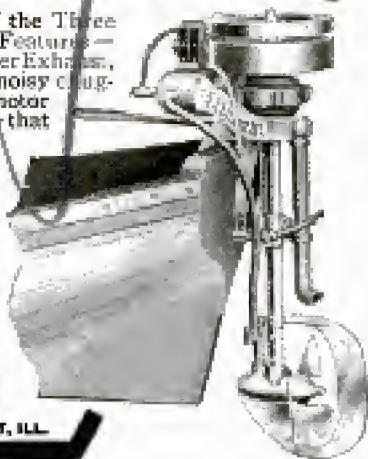
50 Leading Boat Builders have joined with the
Gray Motor Company in issuing a catalog showing
the specialties of each, which includes
fishing launches complete from \$25 upward to
multimasted finished express launches with Self-
starting 6-Cylinder 4-Cycle Gray Motors for
\$250. Cruisers from \$150 up. This book helps
you select just the model of boat you have been
looking for and tells you where to buy it and
what it will cost. Send for this big Boat Cata-
log today. Free. Also Gray Marine Engine
Catalog showing full line of 2 and 4 cycle
marine motors from \$35 upwards, one to six cylin-
ders. **GRAY MOTOR CO., 330 Gray Motor Bldg., Detroit, Mich.**

The Perfect — The Powerful Rowboat Motor!

The one that you can *depend upon*, never to falter or fail! The rowboat that is equipped with the same reliable ignition system that is today standard equipment of the highest grade automobiles — the Bosch High-Tension Magneto. Before you invest a dollar in any rowboat motor, you want to investigate the

Spinaway
Detachable
Rowboat Motor

Enjoy the benefits of the Three Exclusive Spinaway Features — the unique Under-Water Exhaust, that obviates all the noisy clug-chug of the usual motor — Self-Locking Tiller that will hold the boat true to its course without any attention on the part of the operator — Disappearing Crank-Handle, that unique device that prevents accidents from twirling crank-handle that stands upright. Write for the free 1915 Spinaway book today.
SPINAWAY BOAT MOTOR COMPANY
265 Chicago St., FREEPORT, ILL.



SPECIAL

\$4.75

Size 7 x 7 ft.
Genuine Full Weight
8 oz. Duck



Boys' Special Offer Genuine Wall Tent Complete

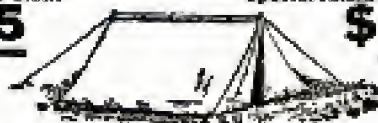
Just think of it. This 7x7 foot genuine eight-ounce duck wall tent for only \$4.75. Everything complete. Poles, ropes and pins. Big enough for four boys. Strong enough to stand blizzards or storms. You can have lots of fun this winter. Don't stay in the house. Take your boy friends out in the tent. You cannot possibly get wet. It's nice and warm too. Great to sleep in. Start to save today. Sign your name to the coupon and tear it off and send it to us. We will mail you at once a beautiful book telling you many things you ought to know about outdoor life. This book is absolutely free and prepaid.

Army Shelter Tents

Commonly Called "Dog Tents" — Made up in 2 Sections, Complete with Poles and Pins

Special White Cloth
\$2.25

Special Khaki Cloth
\$3



Just like the regular soldiers use. Boy Scouts all over the country are using them. Can be set up and taken down in a minute. When not in use can be easily carried on your back. Absolutely waterproof. This tent is 5 ft. 3 in. long by 3 ft. 6 in. wide by 3 ft. 6 in. high. The poles are spliced. Every boy ought to have one of these tents. Send your order in today. They are going like hot cakes.

Send FREE Coupon for New Camp Guide

Just put your name and address on free coupon and mail it at once. We will send you our new 1915 Camp Guide. Gives a hundred pointers on camping boys should know. Tells how, when and where to camp out. We also send a list of supplies you need and where you can get them cheapest. Book is sent free and prepaid. No obligations of any kind. Mail coupon now. Do it now as the supply of these books is limited.

H. Channon Company

Dept. 1183
150 North
Market Street
Chicago
Illinois

**FREE
Camp Guide
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Market St., Chicago

Gentlemen: Please send me, absolutely free and prepaid your new 1915 Camp Guide. Also full particulars of bargains you are offering on tents and other supplies.

Name _____

Address _____

Please Mention Popular Mechanics

Electric Light for Your Home

This newly invented system enables every rural home to make their own electric current; operates from one to fifty lights; and will drive small electric motor, electric iron, toaster, etc. Everything complete in one compact unit; no batteries or switchboard. Uses standard lamps and fixtures that any dealer can supply. Nothing to watch but the small, high-speed gasoline motor, which requires slight attention once a week.

The ideal electric lighting system for country homes. Nothing like it ever sold before. Costs less than other systems to buy and to operate. Will last for years.

WATERMAN MOTOR COMPANY
382 Mt. Elliott Ave. DETROIT, MICH.

Write today for
descriptive lit-
erature and
prices.

Uni-Lectric
GASOLINE-ELECTRIC UNIT
LIGHTING SYSTEM



SAFETY
AND
SERVICE

MULLINS BOATS

SAFETY
AND
SERVICEReady for the
First Trip.

"I am glad we decided upon a Mullins Boat. There's another one out there! See how she glides over the water—swiftly—gracefully—easily—see how she answers the wheel—how the bright work glistens! We may well be proud of our boat."

Built of both wood and steel in the largest boat factory in the world, powered with 2 and 4-cycle motors, pronounced by 60,000 owners the most boat for the money in the country.

Send for interesting, free catalogue and learn where you can see a Mullins Boat

The W. H. Mullins Co.
59 Franklin St. SALEM, OHIO
Also Manufacturers of the Celebrated
Charles River Model Canoe

ROW BOAT MOTOR

FERRO

Don't Go Rowing
Go FERROWING

The Safest Investment of All

The motor you buy must be powerful, speedy, economical, simple and reliable—it must be so constructed as to give best results in hardest service. The price must be reasonable, too. Write at once for our literature and see for yourself why the Ferro is the motor. State whether interested as dealer or user.

The Ferro Machine & Foundry Co.
343 Hubbard Ave. Cleveland, Ohio

\$85

with
Reversible
Waterproof
Muffler

\$65

with
Waterproof
Battery
Ignition



Waterman PORTO



1915 model, 3 h.p., weight 59 lbs. Sold direct from factory to you, freight paid. The original out-board motor. Fourth year—\$3,000 in use. Guaranteed for life. Fits any shaped stern; has carburetor—oil—air—valving valve; reversible levers; solid bronze plate, protecting 10x20 in. propeller. Stows by raising from any part of boat. Water cooled exhaust manifold; automatic under-water exhaust; bronze gear water pump; steel water jacket; any location equipment desired. Demand these accessories if you want your motor's worth. Write today for free engine book. Our prices will surprise you.

WATERMAN MARINE MOTOR CO.
330 McLaughlin Ave., Detroit, Mich.

Makes Any Boat A Motor Boat

LA Rowboat Motor

PLAY SAFE: Try It 30 Days

in your own boat. Test it thoroughly. Be your own salesman and keep the salesman's profit—and it is for you to say when the sale is completed.

Thousands of L-A Rowboat Motors sold and running everywhere. Light weight; detachable; reversible engine; speeds up to 8 miles an hour or slow enough to troll; silent muffler; steers with rudder; bronze under-water parts; magnets furnished at slight extra cost.

Take us up on our 30 day free trial offer today; no sale unless you are satisfied. Catalog free—postal today brings it.

LOCKWOOD-ASH MOTOR CO., 376 Horton Street, Jackson, Mich.

\$45.00
Freight
Paid



Direct
from
Factory
to User

"I'm through with Cheap Tires"

Every bicycle rider says that sooner or later. A good bicycle tire gives you your money's worth every time.

A cheap tire comes as close to being worthless as anything you can buy.

VITALIC Bicycle Tires



You can depend on Vitalic Bicycle Tires for months of hard riding because of the quantity of pure rubber in them and because they have an unbreakable, motorcycle tire fabric. Pay less than the price of Vitalic Tires and you get less rubber, weaker fabric and an undependable tire.

Send for Sample of Tire and for Story,
"The Man Who Rode On His Rims"

Continental Rubber Works, 840 Liberty St., Erie, Pa.



Don't Throw Away Your Worn Tires

For over three years European motorists have been getting from 10,000 to 15,000 miles out of their tires by "half-soiling" them with Steel Studded Treads. In eight months 20,000 American motorists have followed their example and are saving \$50 to \$200 a year in tire expense.

We ship on Approval without a cent deposit, prepay the express and allow you to be the judge.

Durable Treads double the life of your tires and are sold under a signed guarantee for 5,000 miles without puncture. Applied in your own garage in thirty minutes.

Special Discount offered to motorists in new territory on first shipment direct from factory. A postal will get full information and sample within a week. Make size of tires. Don't wait—write today. Address nearest factory office.

THE COLORADO TIRE & LEATHER CO.
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Convert Your Bicycle into a Motor-Cycle

Motor fits any wheel. BEST, MOST RELIABLE, Best hill climber. **MORGAN STEFFEY** is more than all others. Stamp for circulars. **STEFFEY MFG. CO., 5007 Brown Street, PHILA., PA.**

\$40

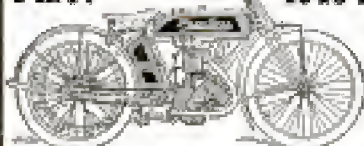
MOTORCYCLES!



New and Rebuilt Motorcycles. Largest stock in the world. Lowest Prices. We guarantee to save you from \$25 to \$50. We repair and make all motorcycles. Send us your motorcycle for repairs. Motorcycles from \$4. Best Bells. 44. Buy direct save dealer's profits. Send for Catalogue. **DENINGER CYCLE CO., ROCHESTER, N. Y.**

5 H. P.

1915 Peerless Motorcycle



with Free Engine, Bosch Magneto, together with the best there is in Motorcycle construction, Power, Speed, Silence, Endurance, and all those wearing qualities so essential for low cost of maintenance. **6 MILES FOR ONE CENT** Agents Wanted—Liberal Discount!

PEERLESS MOTORCYCLE CO., 179 Hunting Ave., BOSTON, MASS.



30 Days FREE TRIAL

and freight prepaid on the new 1915 "RANGER" bicycle. Write at once and get our big catalog and special offers before buying.

Marvelous Improvements. Extraordinary values in our 1915 price offers. You cannot afford to buy without getting our latest propositions. **WRITE TODAY.**

Be a "Rider Agent" and make big money taking orders for bicycles and supplies. Get our liberal terms on a sample to introduce the new "RANGER."

Tires, equipment, sundries and everything in the bicycle line at half usual prices. Auto. and Motorcycle Supplies.

MEAD CYCLE CO., DEPT. D-108, CHICAGO



REFLEX SPARK PLUGS

Give Increased Power and End Ignition Troubles

BECAUSE: Every Reflex plug has our patent baffle that reflects the soot and dirt away from the interior and drives it out through the spark gap at every explosion. Made right, shoot hot flashes; stay clean, keep your motor on the go. 16 leading automobile and motorcycle manufacturers use Reflex plugs as standard equipment—convincing proof of their superiority.

30 DAYS' TRIAL AT OUR RISK

Buy a set of Reflex plugs from your Dealer or direct from us; use them 30 days. Then if they are not the best you ever had, you can return them and get your money right back.

Spark plugs for every purpose—Send for Catalog and prices

The Reflex Ignition Co., 213 High Ave., Cleveland, Ohio



Morgan Gas Lighter

Factory Representatives wanted everywhere to handle our Auto and Hardware Accessories, Unusual Cigarettes, Large Profits. Increasing Demand, White collar, Toner—no cost—Exclusive Territory, Samples, **FREE SALES PLANS!**

Morgan Rolling Wedge Spring Leaf Opener Only indispensable roadside accessory. For substituting Waxes, Auto, or air springs. Best Opportunity for Dealers. Immediate Cash. Popular Prices. Millions will be sold. All our Specialists carry Morgan. Back Guarantee. Write Now to **MORGAN MFG. CO., Bellevue St., Newport, R. I.**



FORD RACERS

REBUILD YOUR FORD CAR.

Sketches, Specifications and Instructions. Information for Two-cent Stamp. **T. M. Co., Dept. A, Box 212, Woodford, Maine.**

The Acetylene Blow Torch

Prest-O-Torch

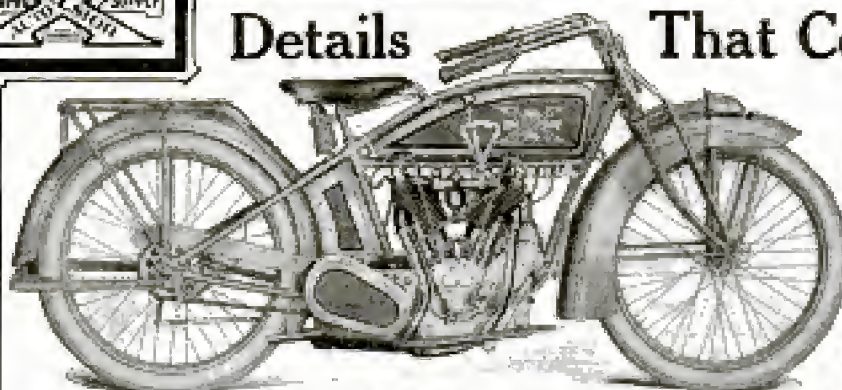
Costs less to buy than a good gasoline blow torch and costs less to use.

In all soldering and brazing, the Prest-O-Torch avoids the delays and uncertainties of gasoline outfits. Provides a concentrated, intense flame that doesn't blow out even in a high wind. Needs no attention whatever. Used with handy sizes of Prest-O-Lite cylinders—ready-made gas. Instantly available.

Style "A" sells for 75c. Used with the small MC size Prest-O-Lite. Will blaze up to 3/4 inch round rod. This outfit can be fitted with handle and hook for added convenience in bench and overhead work. Style "C" Prest-O-Torch is recommended for large work. Will blaze up to 1 1/2 inch round rod. Sells for \$2.35. For use with the larger sizes of Prest-O-Lites. Write for special literature and learn where you can see the Prest-O-Torch in operation. **The Prest-O-Lite Co., Inc., 810 Speedway, Indianapolis, Ind.** Exchange Agents Everywhere



Details That Count



THE NEW EXCELSIOR AUTOCYCLE

Models 15-3 and 15-1

Have more features of real superiority than were ever before combined in a single machine. Note the following features that insure satisfaction in every detail.

THE EXCELLENT AND DISTINGUISHING NEW FEATURES INCLUDE

Extra strong outside joint; low saddle position frame with permanent side car lugs.
Nickel steel forgings throughout; 12 gauge cold drawn seamless tubing; five leaf nickel steel fork springs.
Beautiful round cornered tank with anti-leak needle valve fittings.
Extra large enclosed valves; nickel steel valve mechanism.
Positive, gear driven, mechanical oil pump.
Automobile type three speed; automatically oiled nickel steel transmission.
Automobile type annular ball bearings; non-gran bronze bushings.
Over size, automatically oiled, multiple disc clutch.
Nickel steel neutral shaft; powerful double brakes.
Over size, knock-out axle, hubs; tool steel cups and cones.
Extra heavy roller chains; non-splash fenders.
Long, double hinged foot boards; heavy, unbreakable, armless stand.

Model 15-3, Twin,
Three Speed
\$275.00

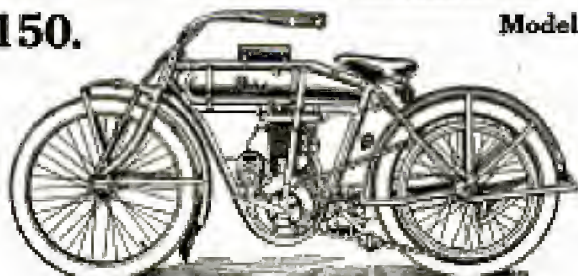
Model 15-1, Same,
Single Speed
\$225.00

Write today for handsome illustrated catalog describing these and four other models

Excelsior Motor Manufacturing & Supply Co. 3702 Cortland St., CHICAGO

\$150.

Model H



Pope Motor Cycle

The Standard Lightweight of America

Low in price—the top notch of efficiency. The very best lightweight motor cycle possible to produce—a little machine with a big record: the greatest value ever offered for the money.

Every part is perfect—built to stand the hardest kind of cross-country work. Easy riding—easy control—4 H. P., speeds varying from 4 to 45 miles per hour. Look for the Pope trade-mark—it guarantees the quality and is the sign of the most complete line in the world of Motorcycles and Bicycles.

MOTOR CYCLES—6 models. Single cylinder—twins and 2 speeds. BICYCLES—82 models. Special light and heavy weights and juveniles.

Send for either catalog you wish.

THE POPE MFG. CO.

16 Cycle Street

Westfield, Mass.

A stream runs most rapidly one-fifth of the depth below the surface, and its average speed is that of the current two-fifths of the depth above the bottom.

SOME CAR!

BOYS!

Send for
Booklet
Today



The Lad's Car

Send 20c today for Booklet, telling how to build this automobile. Complete instructions and descriptions of parts and sizes. Illustrated with diagrams, blue print, cuts made from photographs, and price list of parts.

SPECIAL INDUCEMENT to first boy in your town
Niagara Motor Car Corp'n, Dept. A, Niagara Falls, N. Y.

QUICK ROAD TO HEALTH

Boys and girls from 4 to 15 years of age can now have fun out of doors while they build up strong bodies. Speed without labor. The rider's own weight keeps the car whizzing along. No pushing. Perfect control and safety. Induce the child to spend long hours out of doors in the wind and sun. The



Skudder Car

will develop the lungs, shoulders and legs. Ball bearing, unbreakable steel frame. Let us send you one and show you how it will make your child happy and healthy.

Write for free circular

SKUDDER CO.

Room 516 Straus Bldg., CHICAGO

The Henderson

is the greatest single development in the motorcycle industry. The changes in design and in materials used make the 1915 Henderson the most reliable, the most efficient and the most economical motorcycle in the market.

Have you met "Henderson Bill"?
Write for an introduction.

HENDERSON



The Henderson Motorcycle Company
1150 Cass Ave.
Detroit, U.S.A.

The population of France has increased only 10 per cent in 40 years.

RIDERS THIS CATALOG FREE

Write for it to the largest supply house in U.S.

WE SAVE YOU \$\$\$\$

Our 1915 catalog lists 3015 accessories you should know about. You can't be an up-to-date rider without one. It is the one others try to copy. You need it so send us your name and address today.

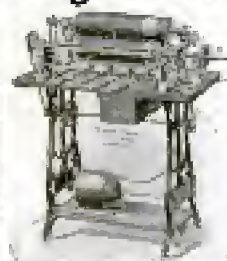


Grow Mushrooms Add \$5 to \$20 a Week to Your INCOME

Grown at home, in basements, barns, sheds, etc. Does not interfere with regular employment. Others are making money in this business. Why not you? It costs nothing to find out how to start, how to sell, etc. Send for illustrated booklet. Address A. V. JACKSON, Fairmount Mushroom Culture, Inc., 542 Girard Street, PALMOUTH, MASS. The Largest Modern Mushroom Farm in the World



Large Profits from Small Capital



A Business of your own bringing you an income of at least \$10.00 per day with practically no experience or overhead expense.

The Green AUTOMATIC MACHINE

sharpeners, hones, and stroppers of all kinds of safety razor blades, all in one operation, at the rate of 150 to 250 blades per hour, you can readily figure your profits. Let us send you our free booklet explaining everything.

Am. Sharpening Machine Co. (Inc.)
Dept. 3, 184 W. Washington St., Chicago

The 1915 "ARROW"

Electric Light



The Wonderful New Motorcycle Type

Send the coupon below today for new catalog of the 1915 "Arrow" Bicycle. Read the sensational improvements in the new 1915 model.

1915 Features

Electric Light

Reinforced motorcycle frame—large, easy motorcycle saddle—long, rubber grip, motorcycle handlebars—New Departure master brake—special motorcycle pedals—motorcycle mudguards, stand and parcel rack—imported anti-friction chain—Pilk. Hot Trend Clincher Tires—beautiful enamel finish.

Other features too. Send the coupon for free catalog.

Nothing like this bicycle has ever been offered before. Built with all the durability and elegance of the very highest grade motorcycles. A positive wonder for speed, easy riding and comfort. The biggest bicycle value ever built. All sizes for boys, men and women. Send the coupon today for free catalog.

Pay As You Ride

Find out about our special rock-bottom direct offer on this New 1915 Arrow. A special 30-day, reduced price offer. We ship the bicycle to you without a penny down. Start riding and enjoying the Arrow right away. And pay the special rock-bottom price—a small amount each month—while you ride. If you do not agree when you see the 1915 Arrow that it is the biggest bicycle bargain you ever saw, send it back at our expense. You be the judge. Send the coupon for free catalog.

Pays for Itself:—The coupon brings our liberal rider-agent proposition. The easiest ever! Just ride your Arrow around. People will admire your handsome bicycle and ask about it. Just answer their questions. You can pay for your Arrow and get extra money besides. Just send the coupon for full particulars and New Catalog.

Send the Coupon Now! Don't delay.

Learn about the sensational 1915 Arrow right away. Take advantage of our special, 30-day rock-bottom price offer. Get the free catalog and details of easy Rider-Agent offer. Send the coupon NOW!

Arrow Cycle Co.

Dept. 1193
19th Street and
California Ave.
Chicago, Ill.

Arrow Cycle Co.
Dept. 1193

19th St. & California Ave.
Chicago - Illinois

Please send me free catalog of the New 1915 Arrow and particulars of your 30-day rock-bottom "Pay-As-You-Ride" Offer and Rider-Agent Proposition.

Name

Address

Please Mention Popular Mechanics



SAVE \$8.25

on this hand-
some Rocker

Simply fasten 8 thumb-screws—all you need is a pair of hands and five minutes time, to save \$8.25 when buying this beautiful—quarter-oak—Japanese leather upholstered—arm rocker. Finished in golden, fumed or early English style, at the direct-from-factory-to-you price of \$11.75.

No. 102

holstered—arm rocker. Finished in golden, fumed or early English style, at the direct-from-factory-to-you price of \$11.75.

This Rocker is built according to the best furniture traditions—seat upholstered with oil tempered Turkish spiral springs, and plenty of them. Fastened securely—the back stuffed with cotton felt, very soft and comfortable.

Rocker Shipped Completely Finished

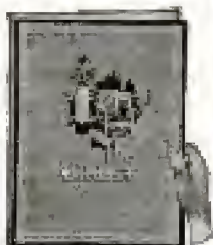
but knocked down to save freight. Simply shows the wonderful possibilities for saving on all your furniture needs by buying the DIRECT way.

Send Today

for our complete **FREE** catalog H of modern furniture—shows hundreds of pieces for living rooms, dining rooms and bed rooms.

DIRECT FURNITURE CO.

Dept. B35, Federal Plaza, CINCINNATI, O.



Firestone CYCLE TIRES

Toughest, thickest, most resilient tread. Built like a motor-car tire. All sizes! Non-skid and corrugated tread.

Firestone Tire and Rubber Company
Akron, Ohio—Branches and Dealers Everywhere

RULE AND LEVEL



**NEW
Accurate
Practical**

2-FT. GENUINE BOXWOOD RULE folding to 8 inches, graduated both sides, middle section fitted with spirit level. 1" wide, handy to carry, 9/16" thick when closed. Cheapest and best thing you can get to serve the two purposes.

ONLY 75c POSTPAID

THE LUFKIN RULE CO. SAGINAW, MICH.



LET OUR EXPERTS Draw Up Your **FREE** Heating Plans

TAKE advantage of our trained experts—be sure of heating every room. Keep down coal bills. Deal direct with manufacturer—save \$25 to \$75 by buying at **Low Wholesale Factory Price**



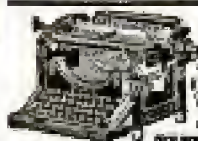
We grant year's test—back guarantee with bank bond—cash or long time credit—easy payments. *We pay freight. Blue prints free*, whether you order or not—no obligations. Write today for

Catalog No. 936.

**Kalamazoo Stove Co., Mfr.
KALAMAZOO, MICH.**

"A Kalamazoo Trade Mark Registered Direct to You"

Women employed in the rubber industry in British Guiana get 20 to 25 cents a day.



TYPEWRITERS ALL MAKES

Prices \$15.00 up. **BOLD or RENTED ANYWHERE** at 10% to 15% **MANUFACTURER'S PRICES**, allowing **RENTAL TO APPLY ON PRICE**. Free Trial. Installment payments if desired. Write for Catalog 1.

TYPEWRITER EXPERTS, 24-30 W. Lake St., Chicago, Ill.

Any SIZE **ONLY \$5** DOWN—One Year to Pay

\$38

buys the reliable U. S. Engine (size 1 1/2 H. P.) direct from our factory on easy payments of only \$5 down and \$3 a month. Free Catalog Folder shows nine larger sizes all sold at similar low prices and on very easy terms. All guaranteed 5 years and backed by 42 years manufacturing experience; all shipped on 30 days' free trial.

U.S. ENGINES



Burn Gasoline, Kerosene or Distillate—have double the power of other engines of equal weight—easiest to move—easy to get at—take up least space—run smoothest—start easy—burn less fuel and last longer. Free Catalog Folder gives 14 reasons for U. S. superiority and quotes low easy-to-pay factory prices. Write now.

U. S. ENGINE WORKS, 3712 Ogden Ave., CHICAGO

A Profitable Vocation

show cards for the smaller merchant, outside of regular working hours. Many persons make good money by lettering price tickets and 3 Shading Pens, 2 colors of Lettering Ink, sample Show Card in colors, instructions, figures and alphabets, Prepaid \$1.00.

Practical Compendium of Commercial Pen Lettering and Designs



TRADE MARK

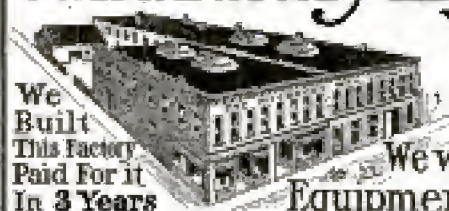
100 pages, 5x11, containing 122 plates of Commercial Pen alphabets, shaded Show Cards in colors, etc., also large list of crisp business Advertising Phrases—a complete instructor for the Marking and Shading Pen. Prepaid, \$1.00. Catalogue free. Address,

NEWTON AUTOMATIC SHADING PEN CO., Dept. A, Pontiac, Mich., U. S. A.

Please Mention Popular Mechanics

Own a Factory like this You Can

We
Built
This Factory
Paid For it
In 3 Years



We will furnish
Equipment Free

Here's a chance for any ambitious man or woman to get into a business that requires no experience and but very little capital (from \$50.00 to \$200.00.) We start you in your own town—furnish the tools free—teach you how to make canvas gloves—show you how to market them.

We do all this for you. Start your factory simply with the understanding that you buy your supplies from us so long as our prices are as low or lower than you can get elsewhere.

The demand for canvas gloves is enormous, everybody everywhere wears them—the farmer—mechanic—doctor—lawyer—laborer. Millions of canvas gloves are required yearly to supply the demand.

Right in Your Own Locality is Your Market

Your surplus can be sold to jobbers and dealers whose names we furnish—you make money from the beginning—profits are immense—are increased the money a few years ago to start—beginning with two sewing machines. Today we own the factory pictured above.

You become in reality, a branch of the McCreery Mfg. Co. working independently—we furnish the raw material—you turn out the finished product—reap the big profits. You are not bound by any contract to buy from us—only a man to man agreement. That's all.

We tell you all about the business in our interesting booklet. Costs you nothing to learn about it. Your copy is now ready to mail to you. Write for it. It's FREE.

Write today for this book. Don't delay it. Only a limited number of equipments will be offered free.

McCREERY MFG. CO., 1021 Front St., TOLEDO, O.

NEW SQUIRT RING

HERE YOU ARE BOYS, a medallion ring of Sept. Morn. Everyone will see it on your finger and try to get a better look. Press the bulb concealed in your hand, and Miss Sept. Morn will do the rest by squirting a fine stream of water all over the curious one. Willing dirt 20 feet. Greatest joke out, and brand new. By mail with Big Catalog 15c.

FISHER NOV. CO., Dept. 65, 721 Sterling Place, BROOKLYN, N.Y.

SEPTEMBER MORN

WATCH FOR, ROSE GOLD Finish. Just like illustration. The bewitching little figure of Miss "September Morn" handsomely embossed on heavy metal. Size of Feb 1 1/4 x 1 1/4. Genuine black leather strap. Boys, a real work of art. Classy, alluring. Makes 'em all take notice. Agents wanted everywhere. Dandy sample job and our great easy money proposition to hustlers sent postpaid 25 cents. Address EMBLEM JEWELRY CO., 401 Maple Bldg., BUFFALO, N. Y.



To Get
Your
Clothes
FREE

Make Big Money During
Something Different, bigger, more liberal
than any offer ever made. Lower prices
—better clothes—bigger cash profits
Express paid on everything.
Complete AGENTS Outfit FREE

Your name on a postal card brings 40
real cloth samples and everything needed
to start earning big money free.

Spencer Mead Co., Dept. 574, Chicago



The Farm YOU Want

is compact, easy to pay for, and
enormously productive—and it
must be suburban to a big live city



Here it is—and it's yours for

IN OUR NEW LITHIA TRACT suburban to Tampa, the metropolis of South Florida. It is one of the few choice suburban farm tracts left in Hillsborough County, the recognized center of Florida's grape fruit and orange belt.

This is the third great Hillsborough County tract that has been opened to homeseekers and investors by our old established, responsible, thoroughly experienced organization. Over 2,500 families are now rejoicing because they bought at opening prices in our two former tracts. Every family can tell you they got a square and generous deal.

Our new Lithia Tract now offers you the same wonderful opportunity—and more, because of the rapid growth and development on all sides within the past four years.

The visible supply of select Hillsborough County grape fruit land is melting away very fast. Prosperous homes are scattered around the Lithia Tract—grape fruit and orange groves are flourishing on all sides. Already buyers are building homes on our new Lithia Tract, and values are due to rise here as they have in our two former suburban farm tracts in this same county.

Free—Absolutely Free—100 grape fruit and orange trees to each and every purchaser who reserves one of these farms before April 1st, 1915. These trees will be held in our Nurseries until you are ready to plant them. This will give you a splendid start in developing a grove which will bring you an ever increasing income and greatly increase the value of your entire farm. Mail the coupon today.

One judicious investment, remember, means more to your bank account than years and years of labor. Honestly, now, what have you to show for that little 8 1/2 cents per acre per day that might just as well be buying you a beautiful 10 acre farm? When also could you put aside a few odd dollars so safely, so securely, and with such surety of seeing your modest savings fund develop into a great big investment?

No use trying to make yourself believe that savings bank interest will ever make you independent, nor 6 per cent loans make you rich. Your money isn't working when you tie it up in such ways—it's LOAFING. Make your money work for YOU! Right here in these rich fruit lands is your opportunity—here where a few dollars put to work NOW will reap all the benefit of development work constantly being done by the fast increasing population.

Get our big new Florida book and look at the map—read the many enthusiastic testimonial letters from settlers now living on the farms they bought from us. Four big railroads intersect these suburban tracts—all the comforts of modern farm life right at hand!

Think of it—a ten-acre farm suburban to a city like this—a farm big enough to keep you in comfort all your life, yet one you can pay for at the rate of just 8 1/2 cents per acre per day!

Larger Farms if Desired—We also have a number of splendid tracts of 40 to 160 acres which are ideal lands for general farming, forage crops and stock raising. Write us for special information, prices and terms on these large farms if interested.

Get the facts now. The coupon brings them to you without cost or obligation. Get this new opportunity clearly before you while prices on this newly opened tract are still low and terms easy. Today \$1.00 per acre per month buys you independence and a future. Tomorrow—who can say?

Tear off the coupon and mail it NOW and we will lay before you, by return mail, full and complete information showing how you can easily become the owner of one of these beautiful grape fruit and orange groves and why it is sure to prove the shrewdest, most profitable investment you can possibly make.

North Tampa Land Co.

C. C. THOMAS, President

837 Marquette Bldg.

CHICAGO

Free and on PAID basis—book that for 400 grape fruit and orange trees, and your share of the richest land in Hillsborough County, Florida.

Name _____ Street No. _____ City _____ State _____

North Tampa Land Co., 837 Marquette Bldg., Chicago

Please Mention Popular Mechanics



BE A MERCHANT

Own a Beautiful Store Like This

You can do it. Once I was just a struggling candy maker. I had no more of a start in life than you—the profits from Crispettes, the new, delicious popcorn confection built this big business for me. I made fortune smile on me in this dignified, profitable, honorable business. I have made a SUCCESS—can look the whole world in the face, and am respected by my friends and neighbors.

I Will Help You to Start. The very proposition that made me, should do the same for you. Don't slave away for some one else. Build a business of your own as I did. Get a window—a small store—a cozy nook, where the rent is low. Keep all the profits. I'll teach you the Crispette business—tell you how to succeed—show you how to make Crispettes by my special secret formula. I do it right here in Springfield—personally or by mail. But the thing for you to do is to start.

Every Nickel Nets You Almost 4 Cents Profit

Every 20 cents invested means practically one dollar in cash. Not theory—not guesswork—not imagination—but the actual proven records of crispette merchants from one end of country to the other.

Come to Springfield at My Expense

Within a radius of 300 miles of Springfield, I will pay your expenses if you buy a machine. Come to investigate every phase of this business—make us prove every statement herein—make us show how the big, honest, legitimate profits are made with such a small investment and light running expenses. Make us prove that any man of ordinary intelligence, ambition and energy can make these big earnings. Send for our FREE Booklet, "Dollars & Sense". It tells the whole story—how and where to start—how to succeed—gives the experience of others. It is worth reading, even if you do not start. If you are looking for a good proposition—a big money maker—send now.

W. Z. LONG CO.



EARN \$7,179.12 IN ONE YEAR

Each as good as this,—bought one of my famous Crispette Machines and now takes in a fortune every year. He is just a plain, ordinary, everyday man, who wanted to get ahead.

YOU CAN DO THE SAME. Somewhere in your town there is a little vacant store—part of a building, a vacant window, a peanut stand where the rent is low. There you can start and set up your machine and make and sell Crispettes—grasping the opportunity that means success.

Another man—another place—made \$1,000 in one month with a Long Crispette Machine. H. W. Makins is his name and he only had a little store window which cost him his last \$50.00 for a month's rent, but at the end of that 30 days he had \$1,000 in real money and clear profit in bank. Today he is independent.

1039 High St., Springfield, Ohio



This is a recent picture of the man who made \$1000 in one month with a Long Crispette machine, in a store window.

PATENTS

If you have an invention which you wish to patent you can write fully and freely to Munn & Co. for advice in regard to the best way of obtaining protection. Please send sketches or a model of your invention and a description of the device, explaining its operation.

All communications are strictly confidential. Our vast practice, extending over a period of nearly seventy years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Hand-Book on Patents is sent free on request. This explains our methods, terms, etc., in regard to *Patents, Trade Marks, Foreign Patents, etc.*

All patents secured through us are described without cost to the patentee in the *SCIENTIFIC AMERICAN*.

MUNN & COMPANY
SOLICITORS OF PATENTS
359 BROADWAY, NEW YORK
and 625 F STREET, WASHINGTON, D. C.



WAVECURL

imparts beautiful wavy curls to hair of either sex. One application makes a mass of wavy curls. For either ladies or gentlemen. Send 15c stamp or coin. Depots: **WAVECURL CO., ST. PAUL, MINN.**

During the fiscal year 1914 services in saving of life and property were rendered and acts of heroism performed by employees of the U. S. Lighthouse Service on vessels or at stations on 124 occasions.

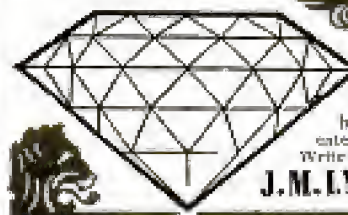
STOP HERE

JUST OUT—New automobile necessity. Deflector for Headlights—puts light on the road, out of people's eyes. Makes better driving light. Not a dimmer. No adjustments—no knobs to turn—once put on is permanent. Lasts as long as the car. Price complete, \$2 per Set. Recommended by police in all large cities. Fine for driving on country roads. Fits any car with electric lights. Dealers and salesmen wanted.

RICKMYER DEFLECTOR CO., 4450 S. & B. Bldg., TOLEDO, OHIO

Furniture On Credit

Write for Mammoth Bargain Book picturing 4,918 articles
SPIEGEL, MAY, STERN CO.
1089 West 35th Street, Chicago



Diamonds on Credit

20% Down; 10% a Month

Every customer is protected by our written guarantee to refund his money if his dealer can duplicate our diamond at our price. Write for Illustrated Catalog No. 3.

J.M. LYON & CO., 71-73 Nassau St. New York City

AGENTS—\$5.00 to \$25.00 a Day—It's Easy**Grand Invention. 150% Profit. Great Excitement Recognized as most phenomenal seller****Experience Unnecessary. Spare time can be devoted if desired LISTEN: One man's orders \$2,850.00 one month—profit \$1,450.00**

Lowry, of Montana, who sold 25 dozen the first two weeks (without previous experience) and made \$187.50, enthusiastically writes: "Why, I could sell this article blindfolded and with a gag in my mouth." Mere boy in Pa. made \$9.00 in 2½ hours. "I do not see how a better seller could be manufactured," reports Parker J. Townsend, Minn. "Started out at 10 a.m., sold 35 by four o'clock," says J. R. Thomas, Colo. "Sold 131 in two days," G. W. Handy, New York. See what a wonderful opportunity. These remarkable reports proven absolutely true by oath-covered evidence—proven to satisfy you beyond a doubt. You can make this money. Work for us and get rich. We want representatives. Agents, Salesmen, Managers—everywhere. Write today. Territory in all sections of the United States, Canada, Mexico and foreign countries to be assigned. The New Easy Wringer Mop tremendously in demand by housewives. Every woman exclaims in delight: "Just what I want!" No more tiresome, back-breaking, miserable mopping days. Drudgery actually transformed into pleasure. The greatest, grandest, most necessary household article ever invented. No need to create selling arguments. Talking barely necessary at all. Simply show—order's landed. This is indeed a wonderful opportunity. Establish yourself in this business at once. Send your name and address on a postal now—right now.

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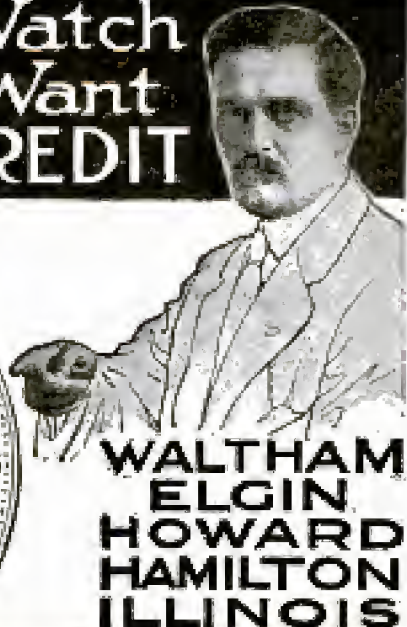
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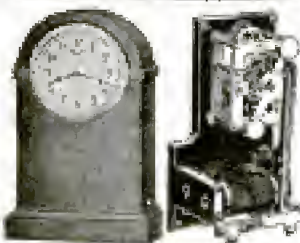
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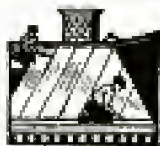


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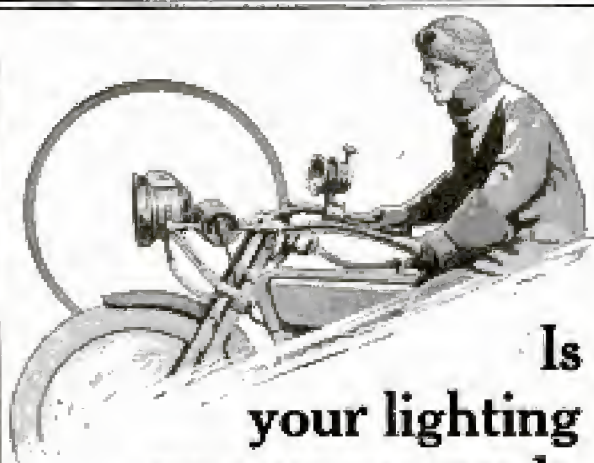
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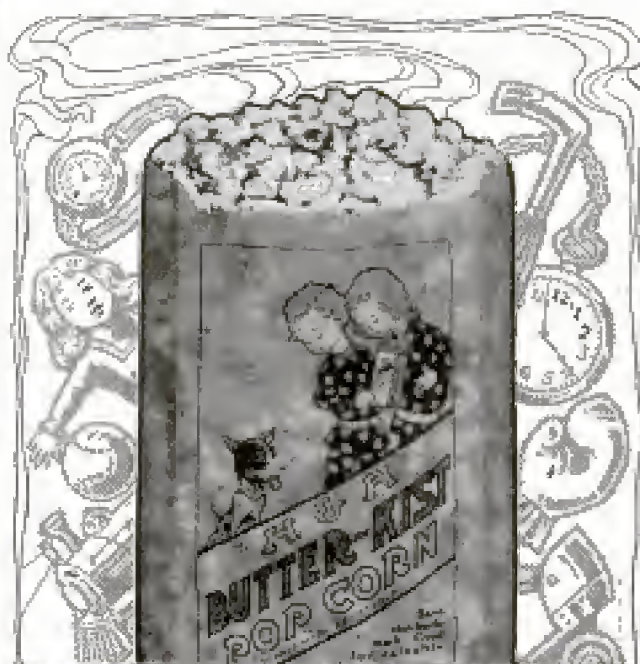
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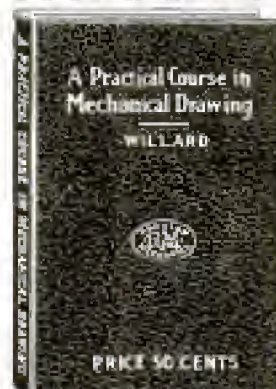
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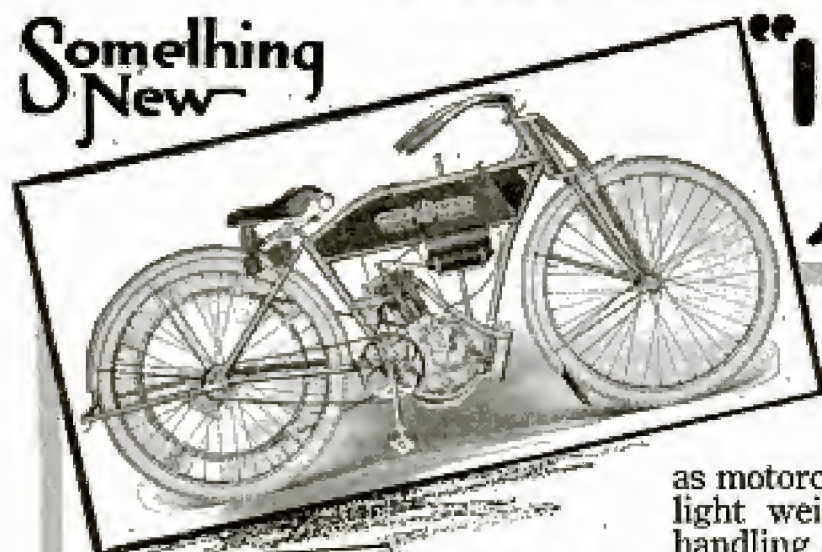
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Prest-O-Lite Acetylene Service furnishes the highest grade of Dissolved Acetylene in portable cylinders, used as conveniently as you use cylinders of oxygen. Saves the large initial outlay and heavy depreciation, trouble and inconvenience of making crude Acetylene in carbide generators. Besides, Prest-O-Lite Dissolved Acetylene is perfectly dried, cleaned and purified—makes better welds and is cheaper to use.

If you use Acetylene for ANY purpose, you should have full details of the liberal Prest-O-Lite Service Plan—made possible by our position as the world's largest makers of Dissolved Acetylene.

A Profitable Business of Your Own

Enterprising men looking for new and highly profitable fields should investigate the wonderful opportunities in doing Oxy-Acetylene repair work for others.



Others are saving money by using Oxy-Acetylene cutting and welding. Send for information or how the process will help you.

The Prest-O-Lite Co., Inc.
The World's Largest Makers of Dissolved Acetylene
816 Speedway Indianapolis, Ind.

53 direct factory branches and charging plants in principal industrial centers.

100 USES

The Jiffy Overall Apron is a patented garment which completely protects the front of the clothes. As the name implies it goes on in a "jiffy" and comes off as quickly. It is universally used by autoists, repairmen, carpenters, printers, engineers, mechanics, bench workers, butchers, butlers, chefs, chauffeurs, laboratory men, manual training students, store clerks, postal clerks, freight and express handlers, cartage and baggagemen, as well as men who take care of their own motor car, furnace or garden.



SPECIAL FEATURES

Combination tool or watch and pencil swinging pocket. Two large pockets used for tools or other articles. Two elbow length over-sleeves with each garment. Patented Clip at bottom of each leg—holds garment in place. Union made in Detroit by the highest skilled labor obtainable. Each garment is guaranteed.



FOUR STYLES

The Jiffy Overall Apron is made in four different styles. \$1
(1) Highest quality blue denim.
(2) Extra heavy, blue and white striped Stetel.
(3) Highest grade water-proofed white duck.
(4) Extra quality, brown khaki.
All garments are of the best workmanship and sold for.....
If your dealer cannot supply you, we will ship direct by parcel post paid upon receipt of one dollar.

The Jiffy Overall Apron is made in 10 different sizes,—to fit the small man of 5 ft. 3 in., up to the tall man of 6 ft. In ordering give your height to the dealer or direct to us, and you will get the correct size.

Demonstrator Agents Wanted

There are many men in which we desire successful men to represent us. Liberal commission allowed for each representation. If interested, write quick.



In the shop

JIFFY OVERALL APRON

(Patents Applied For)



at the bench



In the garage

**NOW
IT
COUPON
DO**

**JIFFY
APRON
CO.**

303 Smith Bldg.
Detroit, Mich.

Please send me by parcel post paid one Jiffy Overall Apron complete with over-sleeves,

style..... for which I enclose \$1.00. My height is.....ft.....in.

Name.....

Address.....

Cut the Cost of Furniture in Two

We can help you do it. Because we are manufacturers with an original method of shipping beautiful, "Master-Built" furniture in sections—direct from factory. We manufacture everything needed in furniture for home, office or club—100 designs in Colonial, Mission and Flanders—all carefully selected quarter-sawn oak.

Buy Direct from Factory and Save Half of Your Furniture Money

only best furniture is considered.

BOOKER No. 102
Dealer's Price \$24.00
Brooks Factory Price \$12.00
quarter-sawn Oak. 19 minutes' work saves about \$12.00.

We are not a mail-order house—not straight manufacturers, and we have devised a twentieth century method of reducing the size of the package. All Brooks "Master-Built" Furniture is

Shipped in Sections—Assembled in Ten Minutes by Anyone

Why not let a few minutes' pleasant work save you many dollars? Our plan is to ship direct to you, the user. Hundreds of dealers now assemble Brooks "Master-Built" furniture in their stores, and sell it at from 40 to 60 per cent above our prices. They get some for superior quality and the economy of our plan.

Our Original Sectional Method Saves % Packing Costs.. Do you wonder why we can save you half your furniture money? The real wonder is why you haven't taken advantage of this money-saving plan before. Write us and receive the Brooks "Master-Built" Furniture catalog. You cannot afford to let furniture dealers keep this book. Send for it now.

BROOKS MANUFACTURING CO., 2703 Brooks Ave., Saginaw, Mich.

Largest Plant of Its Kind in the World

For years we have supplied government institutions and finest homes all over the world where jobbers or wholesalers. We are

method of reducing the size of the package. All Brooks "Master-Built" Furniture is

Write

for Our Free

Book of Finest Furniture



BOOKER No. 409
Dealer's Price \$65.00
Brooks Factory Price \$32.50
Beautiful quarter-sawn Oak in matching style. 10 minutes' work saves you about \$32.50.

Oh, You Skinny!

Why starve thin as a rail? You don't have to! And you don't have to go through life with a chest that the tailor never fits; with a weak, childish strength; with legs you can hardly stand on. And what about that stomach that flaches every time you try to square a meal? Are you a pull-pusher?

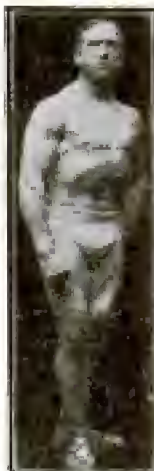
Do you expect Health and Strength in tabloid form—through pills, potions and other exploited piffle?

You can't do it; it can't be done.

The only way to be well is to build up your body—all of it—through nature's methods—not by pampering the stomach. It is not fate that is making you a failure; it's that poor, emaciated body of yours; your listlessness shows plain in your face and the weak, lank, healthy people. Be healthy—strong—well! That's living. Don't think too long; send 4 cents in stamps to cover mailing of my book, "FATNESS—GAINS IN PHYSICAL CULTURE," written by the strongest physical culture instructor in the world.

LIONEL STRONGFORT

2246 Hancock Avenue, Jersey City Heights, N. J.



Put Your Body in Tune

The Flynn System of Health Culture makes you clear-eyed, erect, vigorous, ambitious, buoyant, vibrant. It vitalizes and energizes every organ; develops a reserve force of body, brain and nerve—puts your whole being in tune. A rational and simple system that brings you health and gives vigor, happiness and success.

For thirty-six years I have taught this system from lecture platform and in class, teaching a yearly average of 257,000 persons. My correspondence course enlarges the work and makes it more effective. Cost small, no extra labor; investment returned many times a year in savings and increased efficiency. For men and women. Write for free literature.

W. EARL FLYNN Dept. 18, Lincoln, Nebraska



Repair Tires—Make Money

Many Men are Making \$60 or More a Week

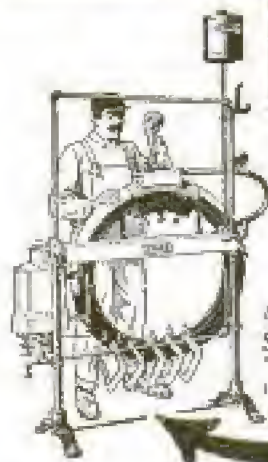
No experience needed. We teach you everything free. Every car owner in your town is a possible customer. Tires blow out every day. Jobs are plentiful—always. The money will come rolling in fast. There's no stopping it once you are known as a tire repair man.

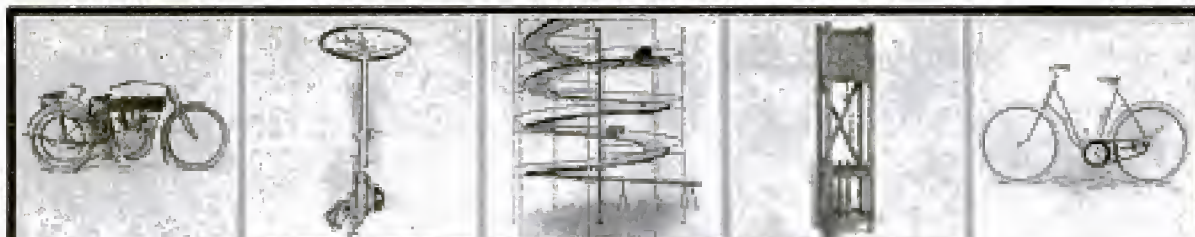
SHALER Vulcanizing Outfits

Anyone with ordinary intelligence can make a perfect repair the first time.

Send No Money investigate this now before some other wide-awake fellow gets ahead of you. Don't send a penny. Get all the particulars first and find out how the big money is made. Write today—no need. Don't delay—the automobile season will open up big. Tire repairs will soon be needed every hour of the day. Write at once. Learn the facts about this immensely profitable business.

C. A. SHALER CO., 1500 Fourth Street, Waupun, Wis.





Make It of Steel Tubing

IF YOU design, build, or improve metal products of any kind, investigate the merits of Stanweld Steel Tubing.

Stanweld Steel Tubing is made of the finest steel procurable for the purpose. It is exceptionally strong. It is very light in weight. And, it has the finest finishing-surface known to steel tubing.

STANWELD TUBING

Stanweld Steel Tubing has replaced copper and brass tubing and expensive machined parts in the manufacture of thousands of mechanical specialties—adding to the quality, and reducing the cost.

It is used extensively by the world's largest maker of motor cars; by the world's largest manufacturer of motorcycles; and by the world's largest producer of bicycles.

It can be furnished in straight lengths of from one to a million feet. Or, we can develop from your ideas, suggestions, or drawings, special tube parts that will exactly meet your requirements. No order is too big—no job too difficult.

Our service-department will gladly answer questions regarding the use of steel tubing for any purpose. Manufacturers building new products, or improving old ones—inventors designing new equipment, or building models, will find this service-department of real assistance.

For information and catalogs, address

The Standard Welding Company

"World's Largest Producers of Bent Tube Parts"

Detroit Avenue

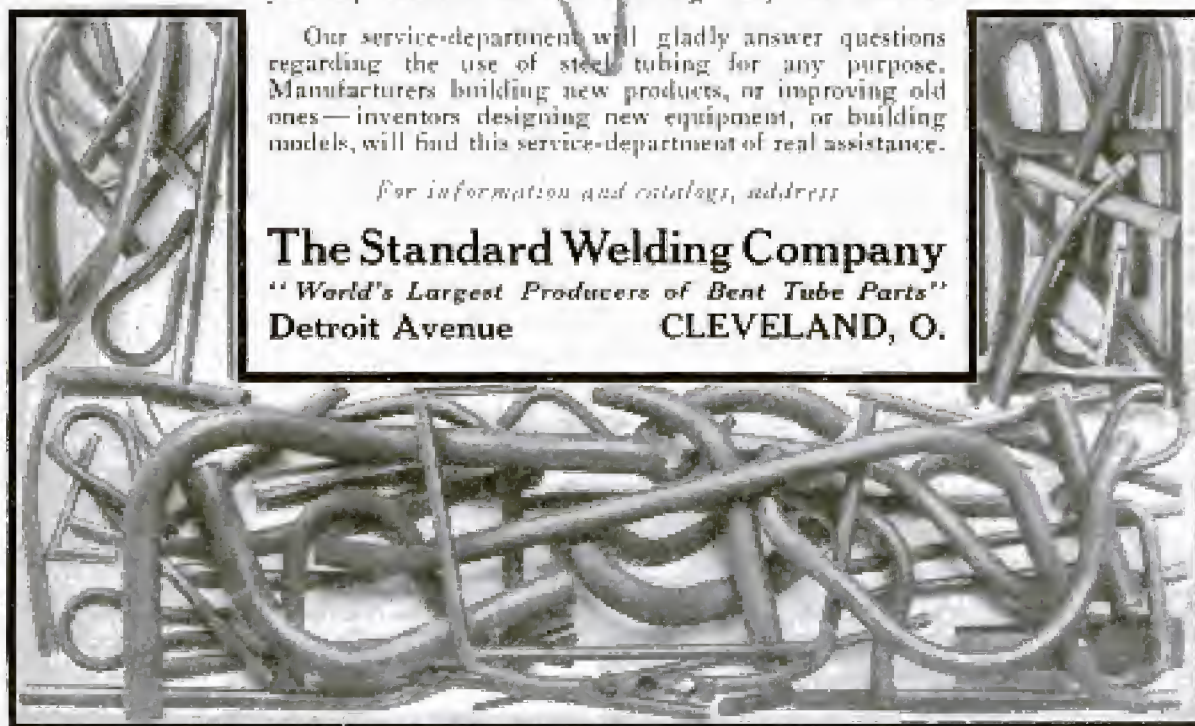
CLEVELAND, O.

Made of STANWELD TUBING

Automobile Parts
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Toys, Models
Railings, Handles
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Sewing Machines
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An Appeal to Americans

By

The Commission for Relief in Belgium

Sole Clearing House for All Belgium Relief

We, as Americans, are enlisted for the war to save seven million men, women and children. It is the greatest commissary undertaking in the history of the world, and in the lexicon of America there is no such word as fail.

We Need Food Supplies as Well as Cash

Every penny donated to this commission goes, without reserve, for the purchase of food. Money donated will be credited to your state, and, whenever it can be done advantageously, spent within the borders of your state. We pay the freight from a special fund donated to organization and transportation.

Railroads, express companies, postoffice, governors and state committees are aiding. Our Flotilla of Mercy, comprising thirty-five chartered ships, is constantly carrying food. **But—Our Supplies Are Far Too Short!**

Has Your State Sent a Ship to Belgium? Is It Planning to Send One?

Is there a committee for Belgium relief in your community?

If there is none, start one under our official sanction.

Are You Helping? If Not, Send in Your Name Now!

Make out your check or money order, or send cash either to your state committee co-operating with this Commission or to the New York Headquarters:

The Commission for Relief in Belgium

71 Broadway, New York, N. Y.

Checks to the Woman's Section should be made out to
Miss Anne Morgan, Treasurer, No. 1 Madison Avenue, New York.

The Commission for Relief in Belgium

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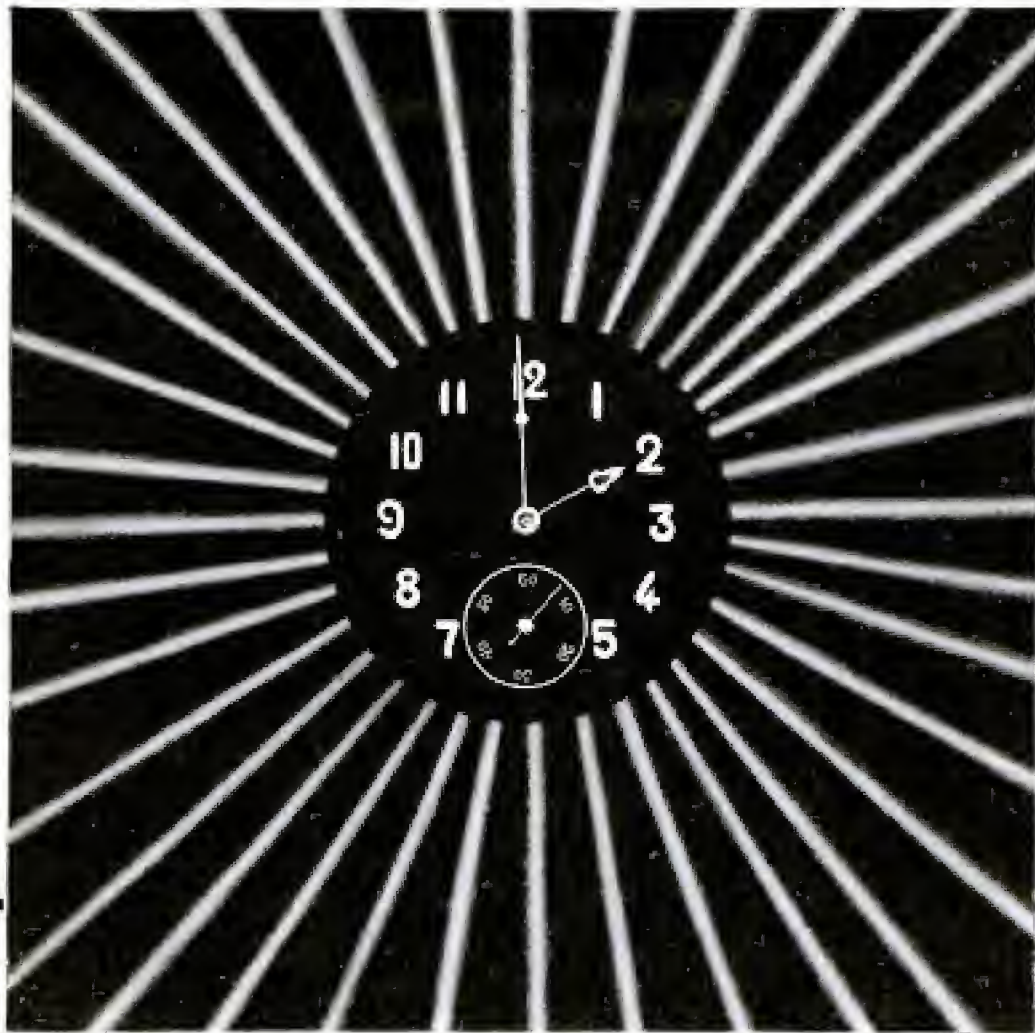
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Startling New Ideas in Watches

SEND for watch catalog describing, among others, the new radium dials that shine at night—the remarkable discovery enabling you to read time plainly in pitch darkness! The new catalog shows many other novel ideas in Burlington watches. The newest ribbon and enamel monogram designs—exquisite new ideas—your own initials in color on a rich gold background. Send the coupon today.

On Approval: The new radium dial Burlington or any other Burlington, with your own monogram engraved on the superb gold strata case will be sent to you *on approval*, prepaid, without a cent in advance. You risk absolutely nothing—you pay nothing—not one cent, unless you want this exceptional offer after seeing and thoroughly inspecting the watch.

If—after examination—you decide to keep it, pay only the direct rock-bottom price—the same price that even the wholesale jeweler must pay. And in order to encourage everybody to secure this watch now we allow this rock-bottom price, either for cash or \$2.50 a month. Remember—we send this watch on approval.



Send the Coupon for New Watch Book

Learn the inside facts about watch prices and the many superior points of the Burlington over double-priced products. Just send the coupon or a letter or a postal. Don't delay—write—get this great offer while it lasts.

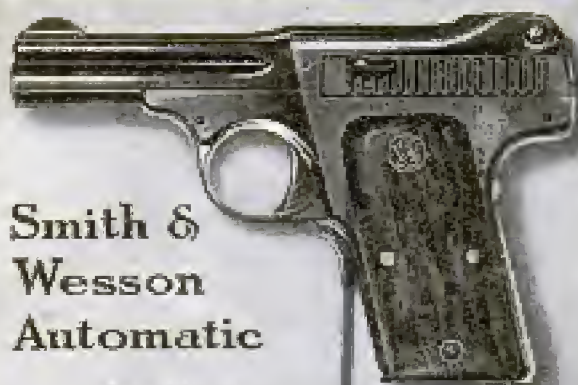
Burlington Watch Co.
19th St. & Marshall Blvd., Dept. 1193
Chicago, Ill.

Burlington Watch Co.
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Chicago, Ill.

Please send me (without obligation and prepay) your free book on watches with full explanation of your cash or \$2.50 a month offer on the Burlington Watches.

Name

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**Smith &
Wesson
Automatic**

Doubly safe

**Accurate and Strong,
as are all**

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Get your dealer to show
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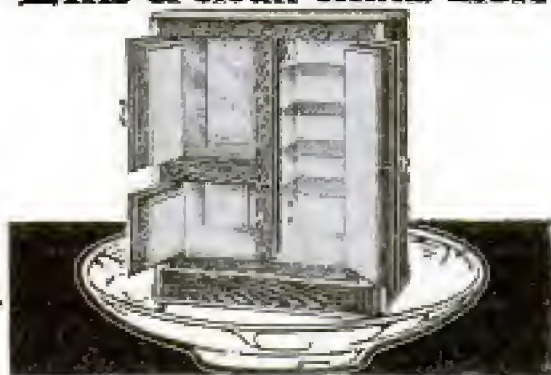
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SMITH & WESSON
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Every Smith & Wesson is the Best of its kind

Like a clean china dish



Superb Porcelain Lined—the delight of every woman's heart—the pride of every housekeeper. Here's that famous refrigerator with the seamless, scratchless, germ-proof lining, the genuine

Leonard Cleanable

Don't confuse this wonderful one-piece lining with paint or enamel. I will mail you—free—a sample of Leonard Porcelain that will quickly show you the difference. **You can't scratch it even with a knife.** It's everlasting—easily kept beautifully sweet and clean. You'll never be bothered with anything else. Can be arranged for outside icing and water cooling. Style shown is No. 4 in polished oak case. **\$35.00**

50 Styles, \$15.00 up; Freight Paid

on Ohio and Mississippi Rivers. Take the risk; send for catalog today. Money returned if you are not perfectly satisfied. Ask for sample of porcelain and I'll mail my booklet, "Care of Refrigerators." Every woman should have a copy of this valuable book.

C. H. LEONARD, President

Grand Rapids Refrigerator Company
157 Clyde Park Ave., Grand Rapids, Mich. (1)

Startling Steel Shingle Prices !!!

War has knocked prices flying. Renew that roof now—make it steel-proof against rot, rust, fire, water and after-expense. Do it with Edwards Steel Shingles. Cheaper and better than wood. Easier to apply. Last five times as long. Edwards patented "Lightcote" process makes roof weather-proof and trouble-proof. Patented Interlocking Device makes roof covering virtually one-piece.

Edwards STEEL Shingles

Dipped in molten zinc **after** they are cut. No raw edges to rot. Come in big bulky clusters of 100 or more. Applied ten times faster than wood shingles. Hammer and nails are the only tools you need. No after trouble or expense. Forget you have a roof.

Free Insurance Against Lightning Loss

● 125,000 Edwards roofs are protected against lightning loss under a \$10,000 Guarantee Bond. This offer holds good to you. But act **now** on this war-time offer. Prices may jump any day. This is a factory-to-you proposition. You

auto start way. Write for Primer and Catalog 350 N. W. Give an dimension of roof, if possible. We help you buy. We also make a roof ready for every kind of building. Write now—right now!

The Edwards Manufacturing Company
300-350 Lock Street
CINCINNATI, OHIO



Go In Business With Me

Big Money at Once

I want to set you up in business that means personal independence; guarantees better than an average living and a sure return for every honest effort. I have put the best 14 years of my life into this business, and now I am ready to give the benefit of my experience, and coach you straight to success.

Ann Arbor Lamps

solve the problem of small town and farm house lighting; give the most light for the least money—100 candle power lamp costs one cent for three hours' light.

They sell on sight—W. H. Phillips, Palmyra, Pa., says, "I sold and collected for 25 lamps out of 27 trials in 4 days. They sell themselves."

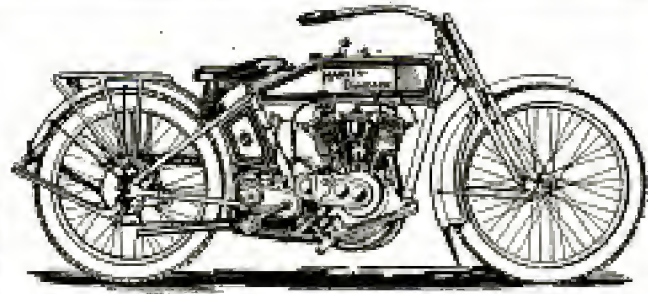
The farmer has the money and needs better lights than the old-fashioned kerosene oil lamps. This is your opportunity. Write me the very next thing you do—it will be the most important step you ever took. No matter what you think of your ability to sell goods—my plan is fool-proof.



H. H. SEELEY

President SUPERIOR MFG. COMPANY
234 Second St. ANN ARBOR, MICH.





The 1915 Harley-Davidson

*with sidecar and extra passenger
going up a 40 per cent grade*

THE 1915 Harley-Davidson three-speed twin is the logical sidecar machine. The eleven horsepower motor (horsepower guaranteed) together with the three-speeds supply sufficient power to carry rider, sidecar and passenger anywhere on a public highway.

When used in conjunction with a Harley-Davidson sidecar with adjustable tread (44 to 56 inches) it becomes an all the year round machine. It will easily negotiate sand, snow and mud, that is impassable for the ordinary automobile. Such an outfit is ideal for country use. It provides pleasure for the family at a small fraction of the operating or up-keep cost of other popular methods of travel.

The 1915 Harley-Davidson is a masterpiece mechanically. The three-

speed transmission is so well designed and the gears so perfectly made that they are absolutely noiseless when in operation. In fact nearly everyone of the ninety-eight improvements and refinements are mechanical superiorities.

These improvements, as well as the complete details of the 1915 Harley-Davidson models are described in the catalog which may be obtained of any Harley-Davidson dealer or will be sent on request.

More Dealers for 1915

Additions to the Harley-Davidson factories enable us to add more dealers for 1915. If, as a dealer, you are situated in a locality where we are not represented and feel qualified to represent the Harley-Davidson in keeping with the Harley-Davidson name and reputation, get in touch with us at once.

Harley-Davidson Motor Co., 409-B STREET
MILWAUKEE, WIS.

Producers of High Grade Motorcycles for Nearly Fourteen Years.

Small Enough For Your Coat Pocket

Big Enough

For Almost Any Boring Job

Here is the acme of compactness and efficiency in a boring tool. A time and labor saver practically indispensable in the shop and about the home.

MILLERS FALLS STAR AUTOMATIC BORER No. 8

Length when extended 7 $\frac{1}{4}$ inches. When compressed 4 $\frac{3}{8}$ inches. Magazine handle contains 8 drill points, ranging from $\frac{1}{8}$ to $\frac{1}{2}$ inches in diameter and an extra screw driver bit. Each bit is released from magazine through small opening at the top without disturbing the others. The screw driver

bit is used when tool is compressed. Powerful chuck grips firmly and centers with absolute accuracy. See this tool at your dealer's. A genuine Millers Falls quality product.

Other Millers Falls Tools You Should Examine

Ask your dealer to show you Millers Falls Hand Drill 800; Bit Brace 782; and Hook Saw Groups 54. Send for handy pocket catalog describing complete line.

MILLERS FALLS CO.
Millers Falls, Mass.

MILLERS FALLS
TOOLS



Send for
Style Book
and 64 Samples
FREE

THE man who reads this ad and does not sit down and send for our big new Style Book and 64 samples of Spring and Summer fabrics, is simply refusing \$6.50 which we guarantee to save him on his next suit.

Our catalog is our only salesman. Because we sell entirely by mail we eliminate representatives and commission men, and are able to deliver the smartest New York tailoring in a positive

\$20 Suit \$13⁵⁰

Made to Measure for

We guarantee to fit you perfectly and give you satisfaction in every respect — otherwise you need not accept the clothes.

Write for catalog and samples tonight. You have nothing to lose and a great deal to save.

BELL TAILORS of NEW YORK
130-132 Walker St. NEW YORK



The Self-Starting Dollar

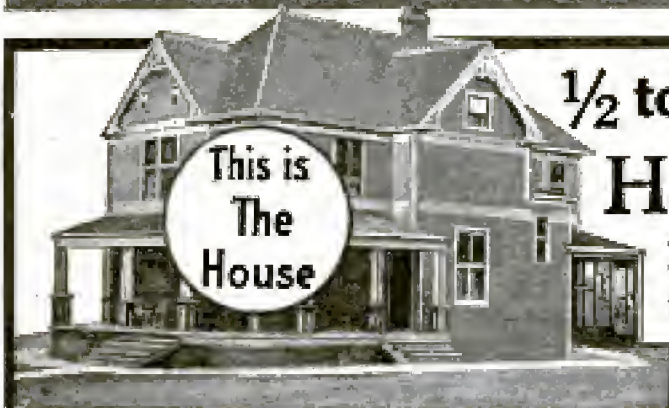
A great new important economic thrift development, a club that embodies the principle of concentrated purchasing, obtaining goods for its members at wholesale prices; large savings; furniture, house furnishings, clothing, books, sporting goods, row boat motors, engines, automobile supplies, automatic water heaters, gas ranges, gas heaters, fixtures and appliances, vacuum cleaners, motors, generators, batteries, wireless and electrical goods of every description; wood and metal patterns, washing machines, filters, plumbing supplies, typewriters, violins, musical instruments, cameras, tools, motorcycles, bicycles, watches, jewelry, diamonds, etc.; all at lowest net cost; you can join this big efficiency movement with unlimited dollar saving possibilities, in best quality goods, buying at less than your regular, NOW, at special rate of \$1.00 for limited time until membership is filled. Write us for quotation on your needs; remit club fee (\$1.00) by check, money order or registered letter, to

UNITED STATES CONSUMERS THRIFT CLUB
123 West Madison Street CHICAGO

(The Great Central Market)

Please Mention Popular Mechanics

Heat Bill Only \$20²⁵ For 10 Rooms



$\frac{1}{2}$ to $\frac{2}{3}$ Saving Guaranteed

HERE'S a big house in cold Illinois. 10 rooms, exposed on all sides. The kind that's usually hard to heat. Yet read the letter. We have thousands of others like it from Underfeed users telling of warmer, cozier homes, and a saving in fuel bills of from one-half to two-thirds.

Carbondale, Ill., March 11, 1914.

Gentlemen: I have used one of your Underfeeds three winters and am highly pleased with it. From the day my furnace was installed in October to the 20th day of March my coal bill was \$20.25. I have a ten-room residence and the entire building was heated all thru the winter. We are not bothered with dust, gas nor smoke.

Yours truly,

(Signed) W. J. BROWN

And 30,000 other Underfeed users are equally enthusiastic over the greatly reduced fuel expense; the better, cleaner heat; the small amount of care and attention required.

WILLIAMSON CUT
NEW-FEED COAL
UNDERFEED BILLS
Furnaces and Boilers $\frac{1}{2}$ to $\frac{2}{3}$

In the Williamson Underfeed, the live body of fire is always on top in direct contact with the most effective radiating surfaces. Coal is fed from below, underneath the fire. No smoke, no gas, no dirt. All these are consumed, giving more heat. Every bit of coal burnt to a clean white ash. Clinkers virtually unknown. And this year sees the Underfeed brought to a still higher degree of perfection in the New-Feed UNDERFEED. No stooping to feed in coal or shake down ashes.

Burns Any Size of Coal

No special coal is prescribed for the Williamson New-Feed UNDERFEED. Any size can be used successfully. Cheap, slack soft coal; and pea or buckwheat hard coal, or larger sizes if desired. It's all the same to the Underfeed. Adapted to warm air, steam or hot water. May be installed in any building new or old, or to replace ordinary furnaces, boilers, stoves or grates.

50 Per Cent Saving Guaranteed

We guarantee a saving over your present coal bills of at least one-half where the Williamson New-Feed UNDERFEED is properly installed and operated. This guarantee is backed by a \$1,000,000 company. Send the attached coupon today, for our great free book "From Overfed to Underfeed" which fully explains just how the New-Feed is operated and how it effects this great saving.

THE WILLIAMSON HEATER CO.

(Formerly The Peck-Williamson Co.)

65 FIFTH AVE.

CINCINNATI, O.



**Cut-Out View
of Furnace**

Showing how live coals are always on top. This is the candle principle. A candle gives a clean, smokeless flame only when flame is at top. Turn a lighted candle upside down and see the difference.

The Williamson Heater Co.

65 Fifth Ave., Cincinnati, Ohio

Tell me how to cut my coal bills from $\frac{1}{2}$ to $\frac{2}{3}$ with a Williamson New-Feed.

Warm Air.....Steam or Hot Water.....
(Mark an X after system interested in)

NAME

ADDRESS

My Dealer's Name is

DEALERS: Let us tell you about the New-Feed UNDERFEED and our 1913 proposition. Both are winners.

LEWIS-BUILT HOMES



\$425
Buys this Beautiful Lewis-Built Home

—A Price Possible
Only by the
LEWIS METHOD

This beautiful bungalow, "The Madrid," is our challenge to the old style home constructor. It is only one of over a hundred houses shown and priced in our great free book. We usually save buyers just what amounts to saving ten, fifteen, twenty, or thirty dollars. Middlemen, lumber dealers and the hosts of other expensive, unscrupulous people not displaced by modern efficient methods.

Lewis-Built Ready Cut Method
means preparing the house at the mill, having the windows to fit, then shipping direct to you with only one small profit to pay. Architects' drawings, plans, furniture, heat, crane, of lumber, shingles, and plaster, hardware, paint, etc., all included. Send for the Lewis-Built House Book containing many original houseplans, columns, houses of every description, many as low as \$125, 175 and your house—the one you have dreamed of owning—second day. Built easy, while building is cheap, and a home is within your reach.


LEWIS MFG. CO., Dept. 378, Bay City, Mich.

Garage \$69.50



10x12 feet "Steelcote" Edwards ready-to-use garage, 300.50 complete. Factory price. Firmwood. Portable. Quickly set up. All styles and sizes of garages and portable buildings. Send postal for illustrated catalog.

THE EDWARDS MFG. CO.
320-370 Exposition Ave., Cincinnati, O.



**A Brand New
REX
Visible
\$2.50**

Only \$2.50 brings you this brand new highest-grade latest improved model REX VISIBLE—the new typewriter sensation. A stupendous value—positively \$100 quality for only \$2.50—on easy monthly payments, a few cents a day. The final perfect typewriter. Guaranteed for 10 years. You save \$41.50 on our great offer. Delivered on 5 days' free trial by our dealer in your town or direct from factory.

Write for Free Catalog No obligations. Write today for our catalog while offer lasts. Send no money. A postal will do.

Rex Typewriter Co. 28 E. Jackson Boulevard
Dept. 3193 — Chicago

This Man Wears a "Glen Rock" Suit It's Stylish and Saved Him \$8



You, too, can have the most stylish spring suit made and save \$8 in the bargain if you order your suit (or light-weight overcoat) by the "Glen Rock" plan.

Here's the plan. We send you our 1915 STYLE BOOK showing 20 large size illustrations of latest spring styles and 40 popular cloth patterns. You pick out the style and cloth that suits your fancy best. Fill out the order blank. A few days later we send you the suit perfectly made and perfectly tailored in every respect.

Every "Glen Rock" suit must fit to your satisfaction or we give you back your money quick.

A safe and easy plan to get a new suit and still save \$8. Thousands of regular customers prove the merit and saving power of our plan. Legal guarantee protects you absolutely.

\$10 SPRING SUITS \$22 FREE!

1915 Spring Style Book

You surely ought to have a copy of this authoritative Style Book. Send us a postal today.

Glen Rock Woolen Co.
219 Main St., Somerville, N. J.



KEITH'S ON HOME BUILDING

20 Cents Copy—Newsstands. (Established 15 Years)
A beautifully illustrated 60-page monthly magazine devoted to building, decorating and furnishing artistic homes at moderate cost. In each issue are 8 New House Plans by leading architects. Subscription \$2.



Big \$1.00 Offer

Six Big Building Numbers of Keith's showing 50 Unique House Plans, and my book, "100 Artistic Homes," making a total of 150 Plans, all for \$1.

Any \$1 Plan Book with Keith's 12 Months for \$2	
125 Bungalow Plans \$1	175 House plans, below \$6,000 \$1
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125 House plans, below \$4,000 \$1	ceement and brick \$1
\$2,000 \$1	60 Garage and 40 Duplexes \$1

M. L. KEITH, 724 McKnight Bldg., MINNEAPOLIS, MINN.

AMUSEMENT MEN, HERE'S THE WINNER!



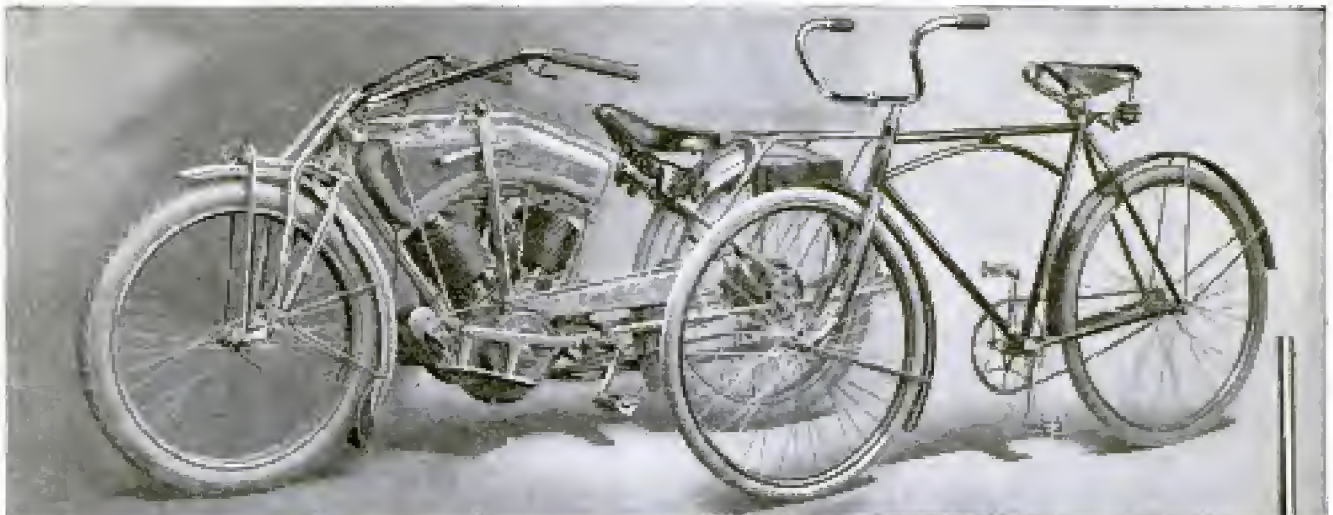
The very latest and most novel amusement attraction for Parks, Resorts, Carnivals, etc.

A BIG Money Maker.

THE CIRCLING WAVE GETS THE CROWD

and keeps them spending their nickels. The most successful fun and profit-maker ever invented. Some operators have made \$400 in ONE day. Move up-to-date and costs 50 per cent less than the old-fashioned Carousel. Easily moved in two wagons. Operated by one man with gasoline or kerosene motor. Can be erected in four hours. Seats 80 people. Price includes complete machine with gasoline motor and either piano or organ. Write for details—a postal will do.

ARMITAGE & GUINN, 1111 St., SPRINGVILLE, N. Y.



IVER JOHNSON

Mechanically Perfect!

The chief reason Iver Johnson Revolvers, Shotguns, Bicycles and Motorcycles are known all over the world for their splendid service is because of the matchless quality of the machine work that goes into our goods.

It would be difficult to construct an instrument of greater precision than the Iver Johnson Revolver. It is perfect in operation and absolutely safe even in the hands of a novice. You can Hammer the Hammer. Note different models below. Prices \$6 to \$8.50. Learn to shoot an Iver Johnson.

Iver Johnson Shotguns are made in Single-barrel and in Double-barrel Hammerless.

Iver Johnson's Bicycles rank as America's leading bicycles. Most racing men ride them. They are fast, durable and beautifully finished. \$25 to \$60.

The Iver Johnson Motorcycle is conceded by engineers to be the most scientifically designed and the most superbly built machine ever produced.

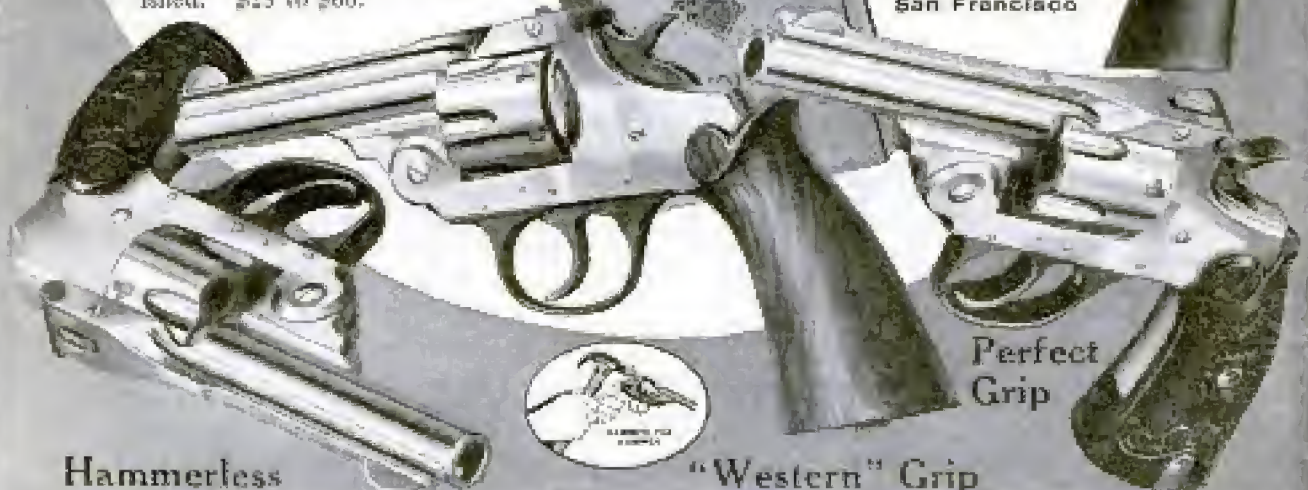
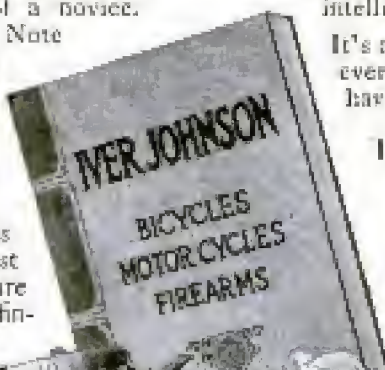
Send for our 34-page book on Bicycles, Motorcycles, Revolvers and Shotguns—single and double-barreled.

This book is bound in stiff board covers and gives all the information anyone needs to know to buy a cycle or firearm intelligently.

It's a costly book, but we want everyone who is interested to have a copy—so it is free.

**IVER JOHNSON'S ARMS
& CYCLE WORKS**
307 River Street
Fitchburg, Mass.

99 Chambers St.
New York
717 Market St.
San Francisco



Hammerless

"Western" Grip

Perfect Grip

Please Mention Popular Mechanics

Hello Boys!

MAKE LOTS OF TOYS

BUILD NEW MODELS AND WIN PRIZES

I want you boys to build for me the biggest, best and most original Models produced for any construction toy. I am willing to dip deep into my pocket to pay you to make a big effort.

THINK OF IT!—300 PRIZES!
Worth \$3,000

Try hard for the Auto—but if you don't win *that*, there are 299 other prizes. Motor Cycles, Bicycles, Camp Outfit, Tents, Canoe, Camera, Skates, Air Rifles, \$25, \$15, \$10, \$7.50, \$5.00 and \$3.00 Erector sets, etc. I want these models to use in showing other boys what can be built.



ERECTOR

(The Toy with Girders like Structural Steel)

You do not have to buy Erector to compete. We cannot tell the full story here. I have prepared a big, special folder full of pictures. Ask your toy dealer for free copy. It gives all details about the auto; its name, specifications, etc.; also illustrates and describes minutely all prizes.

FREE FOLDER

If your toy dealer has no folders write me his name and I will supply you. He sells Erector in sets running from \$1 to \$25. There's an electric motor in all sets at \$5 and over. Yours for a dandy good time, A. C. GILBERT, PRESIDENT.

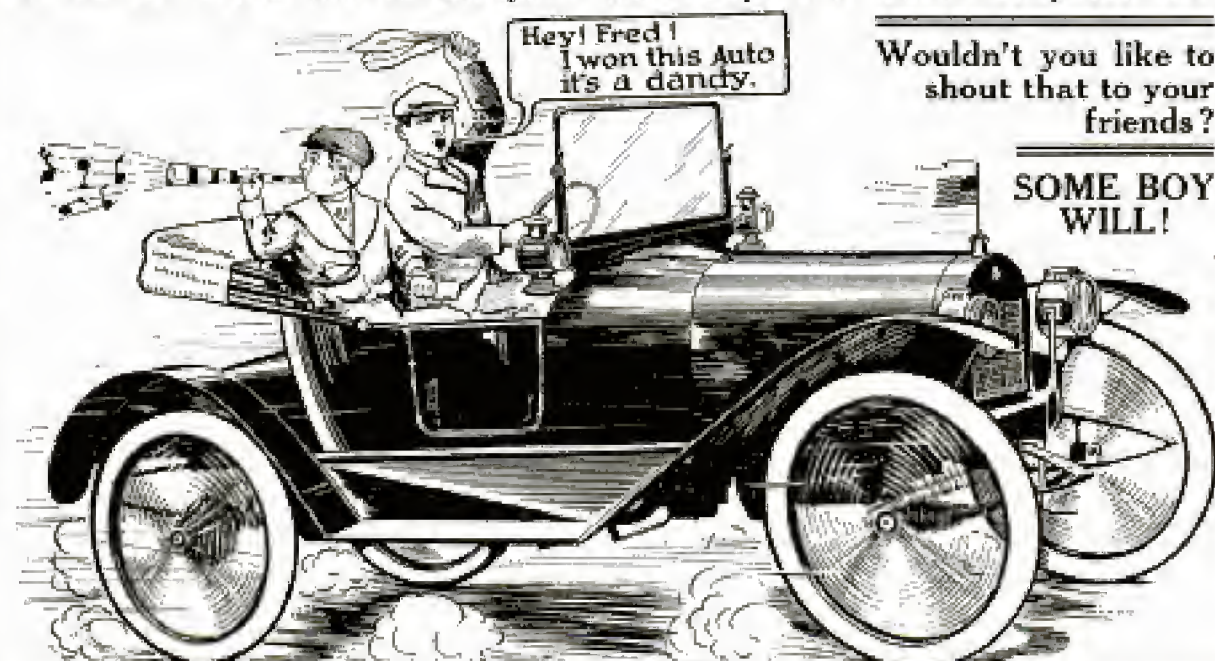
THE MYSTO MFG. CO., 253 Foote St., NEW HAVEN, CONN.

Send
now
for
this
Big
New
Folder



Tells
Whole
Story

It costs
Nothing
to enter
contest



A Reasonable Cash Payment and 38 Cents per Day Buys this Beautiful Sterling Bungalow

Cheaper than Paying Rent

Not satisfied with making absolutely the finest Homes ever designed or with selling at LOWEST PRICES, we now offer American Home Builders an Opportunity to buy on simple, easy, monthly payments—payments which, in all probability, are actually LESS than your monthly rent!

Never before has such an Astounding Offer appeared in print. It marks a new era in Home Building. Thousands, who otherwise would not be in position to build for several years can be living in their new homes before the first of next May.

The Famous Sterling "Two-Years-To-Pay" Plan

For example, suppose you chose the "Miracle"—the handsome Bungalow here pictured—you make a reasonable cash payment, we ship you your Home and you pay the balance in monthly installments of \$11.61, or—38c per day.

Suppose you want the "Martindale"—the charming 5-Room Cottage pictured below—small cash payment—then only \$5.20 per month or 17c per day. No matter what size or style Home you want, you will find it in the latest Sterling Home Builders Book. And you can buy it on our "Two-Years-To-Pay" Plan—easy, monthly payments!



THE "MIRACLE"

One of the most remarkable Homes ever designed—Living room and Dining Room—two large bedrooms—bath—model, work-saving kitchen. Fine Porch—all complete. Can be erected in 12 to 14 days.
\$414 down, balance, \$11.61 per month. Total Cost \$691

As To Price, Quality and Design

Sterling designs are matchless. Sterling Materials are the finest. Sterling prices are unbeatable. OUR CATALOG WILL PROVE IT TO YOU BEYOND QUESTION. The price includes—all materials from the ground up—lumber, hardware, plaster, paint—down to the last nail.

And your lumber comes all MEASURED AND CUT-TO-FIT. That saves you two-thirds the usual carpenter expense. And your Home will be finished in a few weeks. Sterling Homes are permanent, not in any sense portable. Made in a factory which last season built 20 Homes per day.

Prices, \$300 to \$3000. Sold on easy monthly payments so low that—well, send for the Sterling Book and get the whole story. See the new Sterling Designs—large photographs—floor plans and diagrams—beautiful interiors—list of materials furnished—and all about our new "Two-Years-To-Pay" Plan which makes it easier to own a Home than pay rent.

Postal Mailed Now Brings Book by Return Mail

INTERNATIONAL MILL & TIMBER COMPANY

Dept. Q-3

Bay City, Michigan

Be sure to address Dept. Q-3



18c PER DAY

THE "MARTINDALE"—This handsome, 5-room Cottage can be erected in 7 to 9 days. Price and terms: \$137.00 down and \$5.20 per month. Total cost, \$312.00.

Please Mention Popular Mechanics



Chief
Draftsman
Dobe, formerly
with Krupp
Gun Works,
Essen,
Germany

Krupp Gun Designer Will Teach You Drafting

THE draftsmen who design the great German Krupp guns are known all over the world as leading experts of the profession. The Krupp Company puts them to the most severe tests and very few men can qualify. I am proud to say that I passed the examinations and for several years held the position of designer with this wonderful world-renowned works.

I am now Chief Draftsman of a large and well-known company. In my spare time I will train a few ambitious men in practical drafting and designing. I will give you the practical training that I have found to be essential to success—the kind of training that the big companies demand—and I will continue this training just so long as you need it—until you are satisfactorily filling a position as a regular draftsman. You learn in your own home—during your spare time.

Men Are Needed

There is an urgent demand for skilled draftsmen.

Positions paying \$125 to \$175 are open this very minute, and employers are looking for men who have had practical training. This is the kind of training I will give you, and that kind of working training will qualify you for the highest salary. Send the coupon and I will tell you about the big things other men are doing whom I trained personally. Here is an opportunity that come to but few.



**\$15.00 Outfit
FREE**

Yes, I will give you a complete set of regular Draftsman's instruments absolutely free. They are just the kind of instruments the Krupp expert draftsmen use. You could not buy them for less than \$15. But I know that good draftsmen must have good tools. And any man who gets my personal training is going to have the knowledge that makes him capable of holding one of the high-salaried positions.

Send the Coupon for Big New Book

Put your name and address on the coupon or on a letter or a post card and send it to me now. I'll send you, free and prepaid, the new book, "Successful Draftsmanship" that tells you about the golden opportunities that await the men who join our profession. Absolutely no obligations of any kind. I'll tell you how the former Krupp Gun designer will give you the practical training that will make you a high-salaried draftsman right in your own home. Send the coupon now—immediately—it's the first step up the ladder of success.

Chief Draftsman, Dobe
Div. 9193
Engineer's Equipment
Company
Chicago, Ill.

Chief Draftsman, Dobe

Engineer's Equipment Co.

Div. 9193

Chicago, Ill.

Without any obligation to me whatever, please mail your book "Successful Draftsmanship" and full particulars of your liberal "Personal Instruction" offer to a few students. It is understood that I am obligated in no way whatever

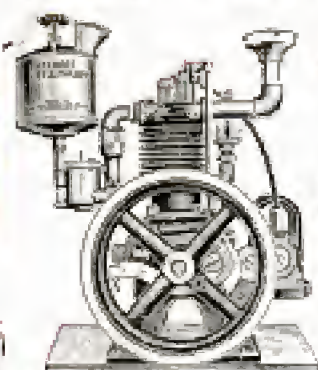


Name

Address

Please Mention Popular Mechanics

THE MARVELOUS STEWART ENGINES

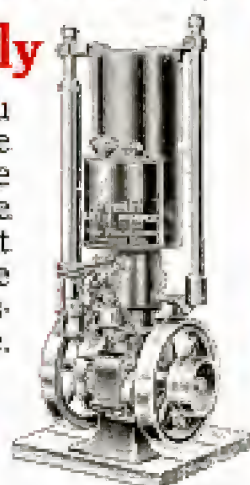


Stewart Little Major
horse power with battery
\$7.50; with high tension
magneto \$37.50.

$\frac{1}{2}$, 2 and $3\frac{1}{2}$ horse power, only

You can buy a poor and cheap watch or you can pay a little more and get a good one and the satisfaction you get with the good one will more than repay you every day you use it. It's the same with engines—you can buy bulk and weight at a price, but real quality engines at a little more in price means so much more in the satisfaction you get out of them that it is worth while.

Stewart Quality Engines
Consist of only those shown here



Stewart Little Wonder
2 horse power water
cooled, with battery
\$50.00; with high tension
magneto \$90.00.



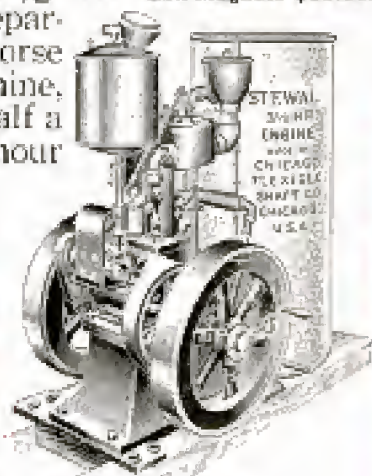
Stewart Little Wonder
2 horse power, air cooled,
with battery \$45.00; with
high tension magneto
\$50.00.

Stewart Little Major is the simplest, sturdiest, most practical $\frac{1}{2}$ horse power engine made. It will do anything that $\frac{1}{2}$ horse power can do. Just the thing to run a hand or foot press, washing machine, ice cream freezer, emery wheel, grindstone, small dynamo, churn, cream separator, pump, saw, feed mill, lathe, horse clipping machine, sheep shearing machine, polishing and buffing wheels, etc. Half a gallon of gasoline runs it for full 10 hour day. Beautifully made and beautifully finished. Get one to run your hand operated machine. It will pay you big.

Stewart 2 and $3\frac{1}{2}$ horse power engines operate on gas, gasoline or kerosene

If you want a real quality engine that will stand up and deliver the goods year after year, place your order now to insure early delivery. Send \$5.00 with order and pay balance when you get the engine. Money back always if not satisfactory, that's the real guarantee.

Write for 1915 catalogue

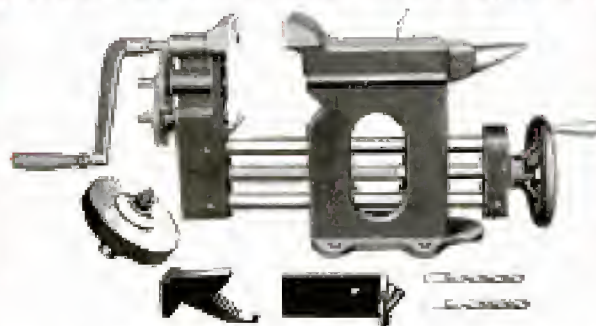


Stewart
 $3\frac{1}{2}$ horse power engine with high
tension magneto \$125.00.

HAVE YOU A HANDY WORKER?

Price, complete, as shown, with all attachments, \$12.50 Weight, boxed, 100 pounds
Size of box, 27" x 13 $\frac{1}{2}$ " x 9"

A unique tool that will quickly pay for itself around any home. Strong and durably built—powerful and efficient in operation. If you have not already secured one, send your order today. Send \$3 and pay balance when you get it.



It Comprises:

A strong and powerful vise, up to 4 $\frac{1}{4}$ inches. Width of jaw, 4 inches. Cutting hardy. Pipe vise takes up to inch and a half pipe. Drill Press which may be operated at two speeds. Anvil. Carborundum grinding wheel, 5 inches x 1 inch. Speed ratios are: direct, 4 to 1 and 16 to 1.

Every automobile owner, every farmer, small shop, garage, etc., will find this compact and practical tool a big dividend payer. You have a dozen uses for it every day of the year. It will pay for itself in no time and is practically everlasting.

The gears where crank-handle attaches are cut from the solid steel bar and permit of three speeds.

The entire tool and attachments are of first quality through-

out. No other tool ever offered at anywhere near this price has the same superior quality and workmanship.

Can be easily and quickly attached to bench or table. Buffing wheel, scratch brush, small circular saw, etc., can be used where grinding wheel attaches.

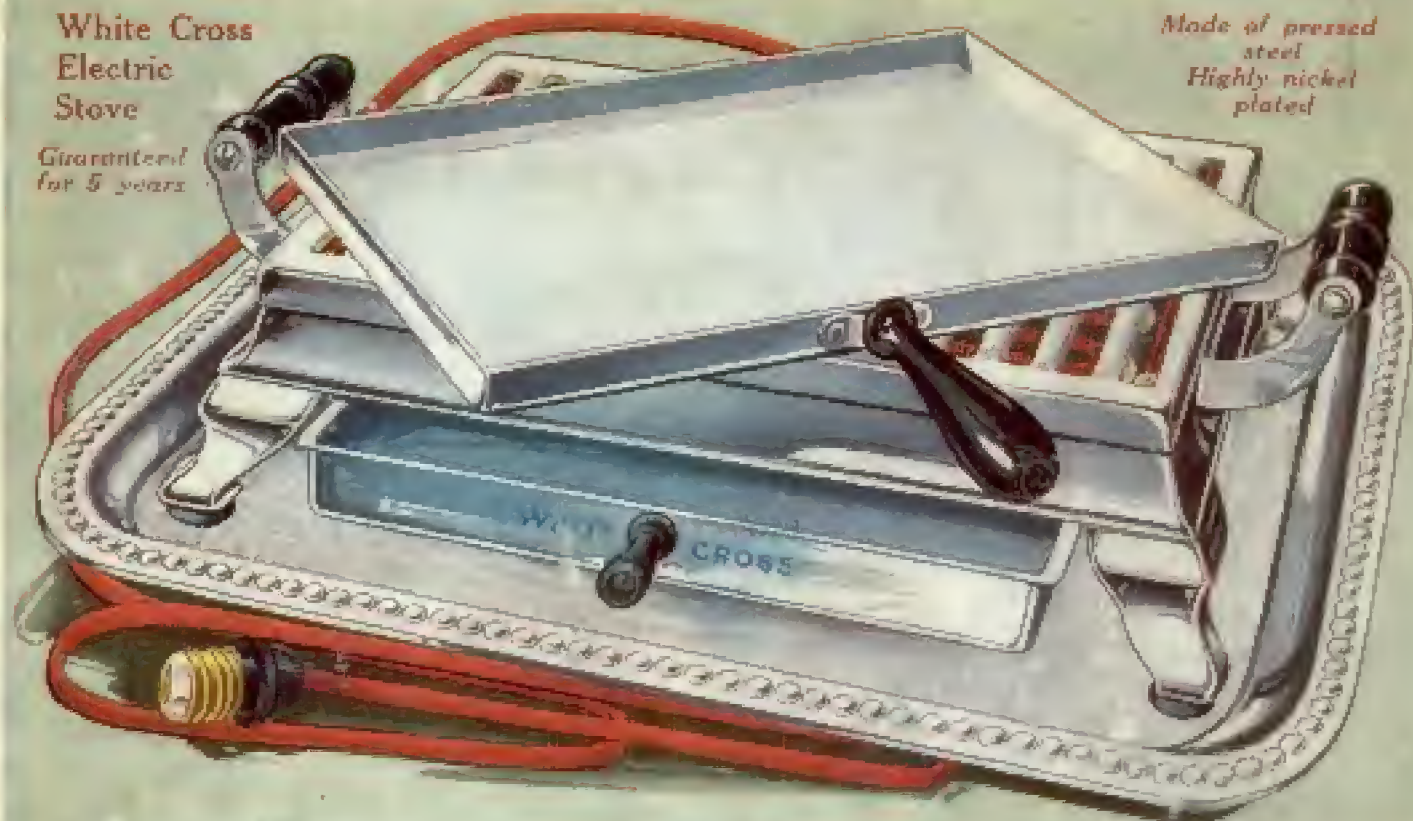
This tool can be used to advantage hundreds of times every year around any home or small shop. It is the ideal handy worker. You need it. Order one today.

CHICAGO FLEXIBLE SHAFT COMPANY, 105 N. La Salle St., Chicago

White Cross
Electric
Stove

Guaranteed
for 5 years

Made of pressed
steel
Highly nickel
plated



Electric Stove \$4.50

Toasting, Frying, Broiling, Tea-Making, Chafing Dish, Boiling

Here at last is a simple electric stove which will do almost any kind of cooking. It is inexpensive to buy—costs but little to run, may be operated on a table, in buffet, dining room or living room. Light enough to be carried about. Run with no more effort than turning on an electric light. If your dealer does not carry it we will send you the new White Cross Electric Stove prepaid, so that you may see it for yourself. If, after examining, you wish to purchase you may do so. The price is only \$4.50 complete, (West of Rocky Mountains \$5.00.)

We protect the transportation charges on every stove. There is nothing for you to pay but the price of the stove, \$4.50, except of Rocky Mountains \$5.00 and that only after examination. And this money will be returned to you any time within 10 days if you do not wish to keep the stove.

Try It 10 Days FREE

Take the stove into your home—make the most delicious toast, tea, coffee—fry steaks, eggs, ham—use for chafing dish and do many other things. Give it a thorough test for 10 days and then if you do not wish to keep it, return it to us and we'll refund every cent of your money.

Send No Money To get this stove all you need to do is to mail the coupon attached to this announcement. Pay only after the stove arrives and after examination. We prepay expressage.

Mail This Coupon

If your dealer does not carry White Cross Electric Stoves put your name and address on the coupon and mail to us today. Remember, we do not expect you to send any money. I am sending of coupon we will send you the stove prepaid for your examination. Then use your own judgment when buying. If you do not think you would like the stove, return it to our company.

LINDSTROM-SMITH CO.

1100-1110 S. Wabash Ave., Dept. 1193, Chicago, Illinois

If you are not ready to send us your name, you may send it for complete literature on White Cross Electric Stoves, or write for our list of new catalog of electrical specialties.

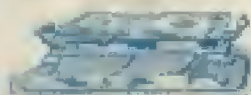
After Free
Examination



For tea, coffee or the chafing dish. The White Cross Electric Stove will start your cooking in a few minutes. No matter how late in the evening and the stove starts working.



For boiling anything—water, breakfast food, soups, vegetables, head lettuce, etc., use for ready cooking.



With the White Cross Electric Stove you can fry, broil, eggs and ham and make toast, etc., at the same time. If you wish only to toast it is large enough to broil and toast from four to six pieces.

Lindstrom-Smith Co.
1100-1110 S. Wabash Ave.,
Dept. 1193, Chicago

Please send me without any White Cross Electric Stove complete and ready to be connected. I have seen and examined it. I like the stove. I will pay \$4.50, total price of the stove, West of Rocky Mountains \$5.00. If I use the stove for ten days I may return it if I wish and you will send my money back.

Name

Address

My Electrical Dealer's Name
Mail postal for literature if you don't want to order now